2

INSTALLATION RESTORATION PROGRAM

PRELIMINARY ASSESSMENT

112th Tactical Control Squadron
and
114th Air Traffic Control Flight

State College Air National Guard Station
Pennsylvania Air National Guard
State College, Pennsylvania

February 1991

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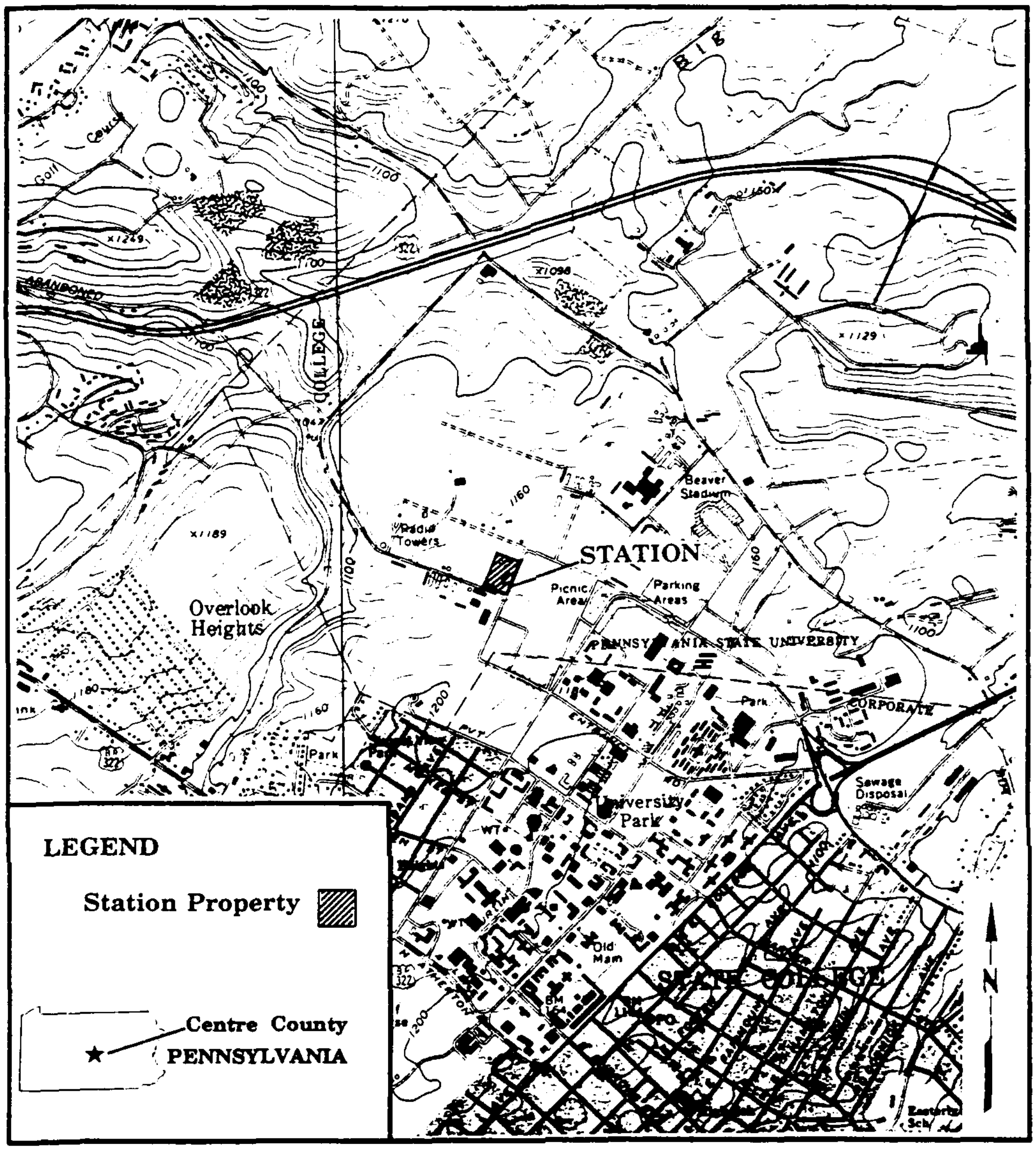

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Preliminary environmental assessment for State College Air National Guard Station, as part of the Installation Restoration Program. The report reflects data gathered from records reviews, interviews, and a site visit. Two sites were identified as potentially contaminated and recommended for further investigation.

14. SUBJECT TERMS Pennsylvania Air National Guard; State College Air National Guard Station; Installation Restoration Program; Preliminary Assessment; Waste Disposal Area; Sump/Dry well.

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INSTALLATION RESTORATION PROGRAM
PRELIMINARY ASSESSMENT

112th TACTICAL CONTROL SQUADRON
AND
114th AIR TRAFFIC CONTROL FLIGHT
STATE COLLEGE AIR NATIONAL GUARD STATION
PENNSYLVANIA AIR NATIONAL GUARD
STATE COLLEGE, PENNSYLVANIA

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TABLE OF CONTENTS

APPENDICES

LIST OF FIGURES

LIST OF TABLES

ACRONYM LIST

ATCF	Air Traffic Control Flight
AGE	Aerospace Ground Equipment
AMSL	Above Mean Sea Level
ANG	Air National Guard
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CES	Civil Engineering Squadron
CFR	Code of Federal Regulations
DEQPPM	Defense Environmental Quality Program Policy Memorandum
DoD	Department of Defense
DOT	Department of Transportation
DRMO	Defense Reutilization and Marketing Office
EIS	Engineering Installation Squadron
EO	Executive Order
EPA	Environmental Protection Agency
FR	Federal Register
FS	Feasibility Study
GPD	Gallons Per Day
GPM	Gallons Per Minute
HARM	Hazard Assessment Rating Methodology
HAS	Hazard Assessment Score
HAZWRAP	Hazardous Waste Remedial Actions Program
IRP	Installation Restoration Program
MOGAS	Automotive Gasoline
NGB	National Guard Bureau
NPDES	National Pollutant Discharge Elimination System
OSHA	Occupational Safety and Health Administration
PA	Preliminary Assessment
PL	Public Law
PNDI	Pennsylvania National Diversity Inventory
POL	Petroleum, Oil, and Lubricant
PSU	Pennsylvania State University
RCRA	Resource Conservation and Recovery Act of 1976
R&D	Research and Development
RI	Remedial Investigation
SARA	Superfund Amendments and Reauthorization Act of 1986
SciTek	Science & Technology, Inc.
SI	Site Investigation
SPCC	Spill Prevention, Control, and Countermeasures
TCS	Tactical Control Squadron
USAF	United States Air Force

ACRONYM LIST (continued)

USC	United States Code
USDA	United States Department of Agriculture
USGS	United States Geological Survey
UST	Underground Storage Tank

EXECUTIVE SUMMARY

A. INTRODUCTION

Science & Technology, Inc. (SciTek) was retained to conduct the Installation Restoration Program (IRP) Preliminary Assessment (PA) of the 112th Tactical Control Squadron (TCS) and the 114th Air Traffic Control Flight (ATCF), State College Air National Guard (ANG) Station [hereinafter referred to as the Station], Pennsylvania Air National Guard, located within the boundary of Pennsylvania State University (PSU) at the city of State College, Pennsylvania. For the purpose of this document, the Station shall include the total area leased by the 112th TCS and the 114th ATCF at State College.

The PA included the following activities:

- an on-site visit, including interviews with a total of seven persons familiar with Station operations, and field surveys by SciTek representatives during the week of May 29-June 1, 1990;

- acquisition and analysis of information on past hazardous materials use, waste generation, and waste disposal at the Station;

- acquisition and analysis of available geological, hydrological, meteorological, and environmental data from federal, state, and local agencies; and

- the identification and assessment of sites on the Station that may have been contaminated with hazardous wastes.

B. MAJOR FINDINGS

The 112th TCS and the 114th ATCF have used hazardous materials and generated small amounts of wastes in mission-oriented operations and maintenance at the Station since 1949.

Operations that have involved the use of hazardous materials and the disposal of hazardous wastes include vehicle maintenance and aerospace ground equipment (AGE) maintenance. The hazardous wastes disposed of through these operations include varying quantities of petroleum-oil-lubricant (POL) products, acids, paints, thinners, strippers, and solvents.

The field surveys and interviews resulted in the identification of two sites that exhibit the potential for contaminant presence and migration.

C. CONCLUSIONS

It has been concluded there are two sites where a potential for contaminant presence exists.

Site No. 1 - Surface Waste Disposal Area (HAS -74)

Site No. 2 - Sump/Dry Well (HAS - 64)

D. RECOMMENDATIONS

Further work under the IRP is recommended for the identified sites to determine the presence or absence of contamination.

I. INTRODUCTION

A. Background

The 112th Tactical Control Squadron (TCS) and the 114th Air Traffic Control Flight (ATCF), State College Air National Guard (ANG) Station [hereinafter referred to as the Station] is located within the boundary of Pennsylvania State University (PSU), the city of State College, and the county of Centre, Pennsylvania. Both units have been active at the Station since 1949. Both the past and current operations have involved the use of potentially hazardous materials and the disposal of wastes. Because of the use of these materials and the disposal of resultant wastes, the National Guard Bureau (NGB) has implemented the Installation Restoration Program (IRP).

The IRP is a comprehensive program designed to:

- o Identify and fully evaluate suspected problems associated with past hazardous waste disposal and/or spill sites on Department of Defense (DoD) installations and

- o Control hazards to human health, welfare, and the environment that may have resulted from these past practices.

During June 1980, DoD issued a Defense Environmental Quality Program Policy Memorandum (DEQPPM 80-6) requiring identification of past hazardous waste disposal sites on DoD installations. The policy was issued in response to the Resource Conservation and Recovery Act (RCRA) of 1976 and in anticipation of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA, Public Law (PL) 96-510) of 1980, commonly known as "Superfund." In August 1981, the President delegated certain authority specified under CERCLA to the Secretary of Defense via an Executive Order (EO 12316). As a result of EO 12316, DoD revised the IRP by issuing DEQPPM 81-5 (December 11, 1981), which reissued and amplified all previous directives and memoranda.

Although the DoD IRP and the Environmental Protection Agency (EPA) Superfund programs were essentially the same, differences in the definition of program activities and lines of authority resulted in some confusion between DoD and state/federal regulatory agencies. These difficulties were rectified via passage of the Superfund Amendments and Reauthorization Act (SARA, PL-99-499) of 1986. On January 23, 1987, Presidential Executive Order EO 12580 was issued. EO 12580 effectively revoked EO 12316 and implemented the changes promulgated by SARA.

The most important changes effected by SARA included the following:

- Section 120 of SARA provides that federal facilities, including those in DoD, are subject to all provisions of CERCLA/SARA concerning site assessment, evaluation under the National Contingency Plan [40CFR300], listing on the National Priorities List, and removal/remedial actions. DoD must therefore comply with all the procedural and substantive requirements (guidelines, rules, regulations, and criteria) promulgated by the EPA under Superfund authority.

- Section 211 of SARA also provides continuing statutory authority for DoD to conduct its IRP as part of the Defense Environmental Restoration Program. This was accomplished by adding Chapter 160, Sections 2701-2707 to Title 10 United States Code (10 USC 160).

- SARA also stipulated that terminology used to describe or otherwise identify actions carried out under the IRP shall be substantially the same as the terminology of the regulations and guidelines issued by the EPA under their Superfund authority.

As a result of SARA, the operational activities of the IRP are currently defined and described as follows:

- **Preliminary Assessment**

  The Preliminary Assessment (PA) process consists of personnel interviews and a records search designed to identify and evaluate past disposal and/or spill sites that might pose a potential and/or actual hazard to public health, public welfare, or the environment. Previously undocumented information is obtained through the interviews. The records search focuses on obtaining useful information from aerial photographs; Station plans; facility inventory documents; lists of hazardous materials used at the Station; Station subcontractor reports; Station correspondence; Material Safety Data Sheets; federal/state agency scientific reports and statistics; federal administrative documents; federal/state records on endangered species, threatened species, and critical habitats; documents from local government offices; and numerous standard reference sources.

- **Site Inspection/Remedial Investigation/Feasibility Study**

The Site Inspection consists of field activities designed to confirm the presence or absence of contamination at the potential sites identified in the PA. An expanded Site Inspection has been designed by the Air National Guard as a Site Investigation. The Site Investigation (SI) will include additional field tests and the installation of monitoring wells to provide data from which site-specific decisions regarding remediation actions can be made. The activities undertaken during the SI fall into three distinct categories: screening activities, confirmation and delineation activities, and optional activities. Screening activities are conducted to gather preliminary data on each site. Confirmation and delineation activities include specific media sampling and laboratory analysis to confirm either the presence or the absence of contamination, levels of contamination, and the potential for contaminant migration. Optional activities will be used if additional data is needed to reach a decision point for a site. The general approach for the design of the SI activities is to sequence the field activities so that data are acquired and used as the field investigation progresses. This is done in order to determine the absence or presence of contamination in a relatively short period of time, optimize data collection and data quality, and to keep costs to a minimum.

The Remedial Investigation (RI) consists of field activities designed to quantify and identify the potential contaminant, the extent of the contaminant plume, and the pathways of contaminant migration.

If applicable, a public health evaluation is performed to analyze the collected data. Field tests, which may necessitate the installation of monitoring wells or the collection and analysis of water, soil, and/or sediment samples, are required. Careful documentation and quality control procedures in accordance with CERCLA/SARA guidelines ensure the validity of data. Hydrogeologic studies are conducted to determine the underlying strata, groundwater flow rates, and direction of contaminant migration. The findings from these studies result in the selection of one or more of the following options:

1. **No Further Action** - Investigations do not indicate harmful levels of contamination that pose a significant threat to human health or the environment. The site does not warrant further IRP action, and a Decision Document will be prepared to close out the site.

2. **Long-Term Monitoring** - Evaluations do not detect sufficient contamination to justify costly remedial actions. Long-term monitoring may be recommended to detect the possibility of future problems.

3. **Feasibility Study** - Investigation confirms the presence of contamination that may pose a threat to human health and/or the environment, and some sort of remedial action is indicated. The Feasibility Study (FS) is therefore designed and developed to identify and select the most appropriate remedial action. The FS may include individual sites, groups of sites, or all sites on an installation. Remedial alternatives are chosen according to engineering and cost feasibility, state/federal regulatory requirements, public health effects, and environmental impacts. The end result of the FS is the selection of the most appropriate remedial action with concurrence by state and/or federal regulatory agencies.

- **Remedial Design/Remedial Action**

  The Remedial Design involves formulation and approval of the engineering designs required to implement the selected remedial action. The Remedial Action is the actual implementation of the remedial alternative. It refers to the accomplishment of measures to eliminate the hazard or, at a minimum, reduce it to an acceptable limit. Covering a landfill with an impermeable cap, pumping and treating contaminated groundwater, installing a new water distribution system, and in situ biodegradation of contaminated soils are examples of remedial measures that might be selected. In some cases, after the remedial actions have been completed, a long-term monitoring system may be installed as a precautionary measure to detect any contaminant migration or to document the efficiency of remediation.

- **Research and Development**

  Research and Development (R&D) activities are not always applicable for an IRP site but may be necessary if there is a requirement for additional research and development of control measures. R&D tasks may be initiated for sites that cannot be characterized or controlled through the application of currently available, proven technology. It can also, in some instances, be used for sites deemed suitable for evaluating new technologies.

- **Immediate Action Alternatives**

  At any point, it may be determined that a former waste disposal site poses an immediate threat to public health or the environment, thus necessitating prompt removal of the contaminant. Immediate action, such as limiting access to the site, capping or removing contaminated soils, and/or providing an alternate water supply may suffice as effective control measures. Sites requiring immediate removal action maintain IRP status in order to determine the need for additional remedial planning or long-term monitoring. Removal measures or other appropriate remedial actions may be implemented during any phase of an IRP project.

B. Purpose

The purpose of this IRP PA is to identify and evaluate suspected problems associated with past waste handling procedures, disposal sites, and spill sites on Station property.

The potential for migration of hazardous contaminants was evaluated by visiting the Station, reviewing existing environmental data, analyzing Station records concerning the use of hazardous materials and the generation of hazardous wastes, and conducting interviews with current Station personnel who had knowledge of past waste disposal techniques and handling methods. Pertinent information collected and analyzed as part of the PA included a records search of the history of the Station; the local geological, hydrological, and meteorological conditions that might influence migration of contaminants; and ecological settings that indicate environmentally sensitive conditions.

C. Scope

The scope was limited to the identification of sites at or under primary control of the Station and evaluation of potential receptors. The PA included:

o an on-site visit during the week of May 29-June 1, 1990;

o acquisition of records and information on hazardous materials use and waste handling practices;

o acquisition of available geological, hydrological, meteorological, land use and zoning, critical habitat, and related data from federal and state agencies;

o a review and analysis of all information obtained; and

o preparation of a summary report to include recommendations for further action.

The subcontractor effort was conducted by the following Science & Technology, Inc. (SciTek) personnel: Mr. Tracy C. Brown, Environmental Analyst; Mr. Charles T. Goodroe, Environmental Protection Specialist; and Mr. Stephen

B. Selecman, Geologist/Hydrogeologist. Mr. Richard Hill of the NGB is Project Officer for this Station and participated in the overall assessment during the week of the station visit. Ms. Patricia Franzen of the Hazardous Waste Remedial Actions Program (HAZWRAP) and Ms. Tullete Belford of the NGB also participated in the Station visit.

The points of contact at the Station were Lieutenant Colonel James M. Herron and Master Sergeant Gerald C. Seeger. Major Donald Bubb (193rd Special Operations Group) was the representative from their civil engineering support facility.

D. Methodology

The PA began with a visit to the Station to identify all operations that may have used hazardous materials or may have generated hazardous wastes. Figure I.1 is a flow chart of the PA methodology.

Seven present Station employees familiar with the various operating procedures were interviewed. These interviews were conducted to determine those areas where waste materials (hazardous or nonhazardous) were used, spilled, stored, disposed of, or released into the environment. The interviewees' knowledge and experience with Station operations averaged 28.5 years and ranged from 18 to 39 years.

Records contained in the Station files were collected and reviewed to supplement the information obtained from the interviews.

Detailed geological, hydrological, meteorological, and environmental data for the area were obtained from the appropriate federal, state, and local agencies. A listing of agency contacts is included as Appendix A.

After a detailed analysis of all the information obtained, it was concluded that two sites may be potentially contaminated with hazardous wastes. Under the IRP program, when sufficient information is available, sites are numerically scored using the Air Force Hazard Assessment Rating Methodology (HARM). A description of HARM is presented in Appendix B.

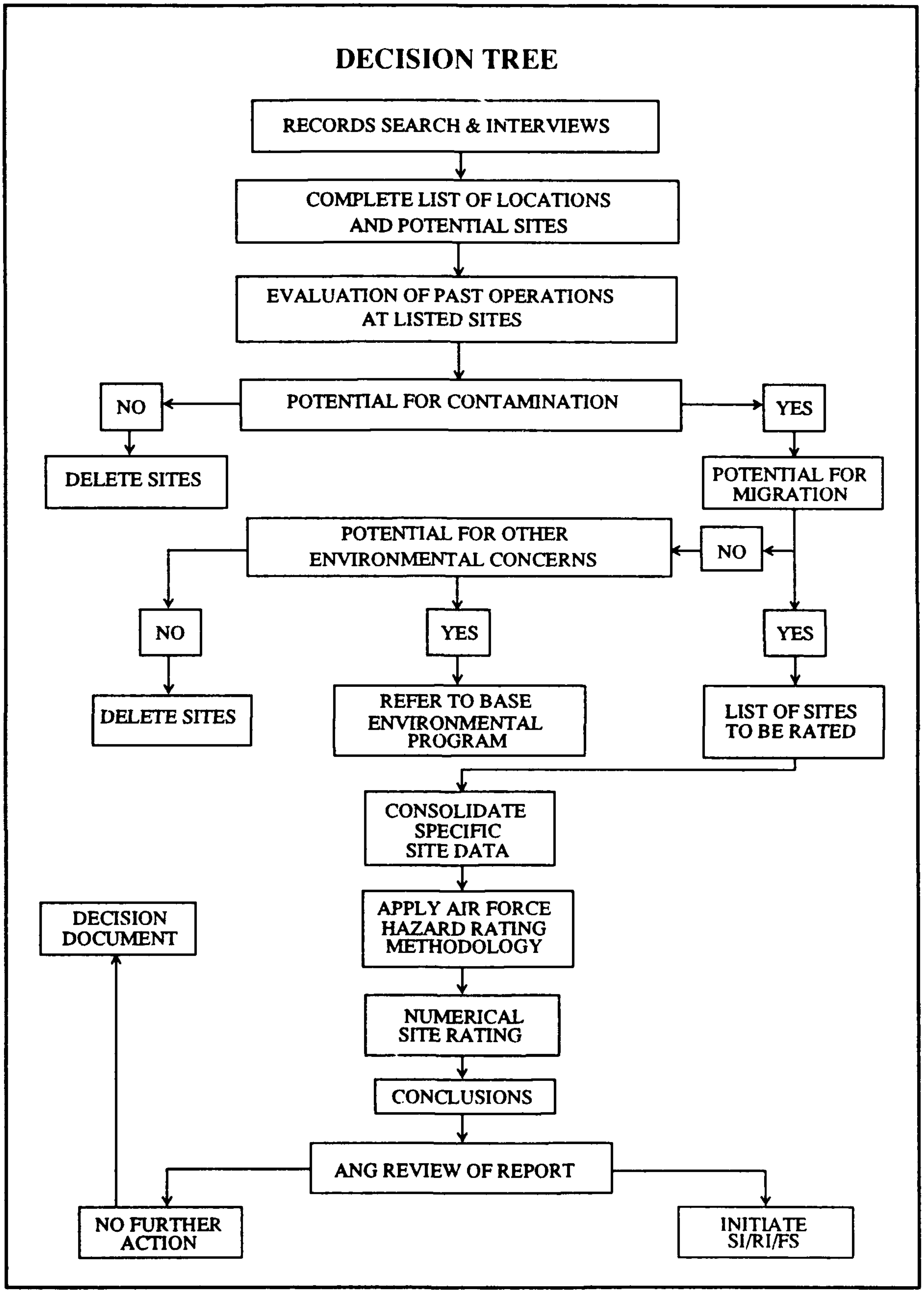


Figure I.1

Preliminary Assessment Methodology Flow Chart

II. INSTALLATION DESCRIPTION

A. Location

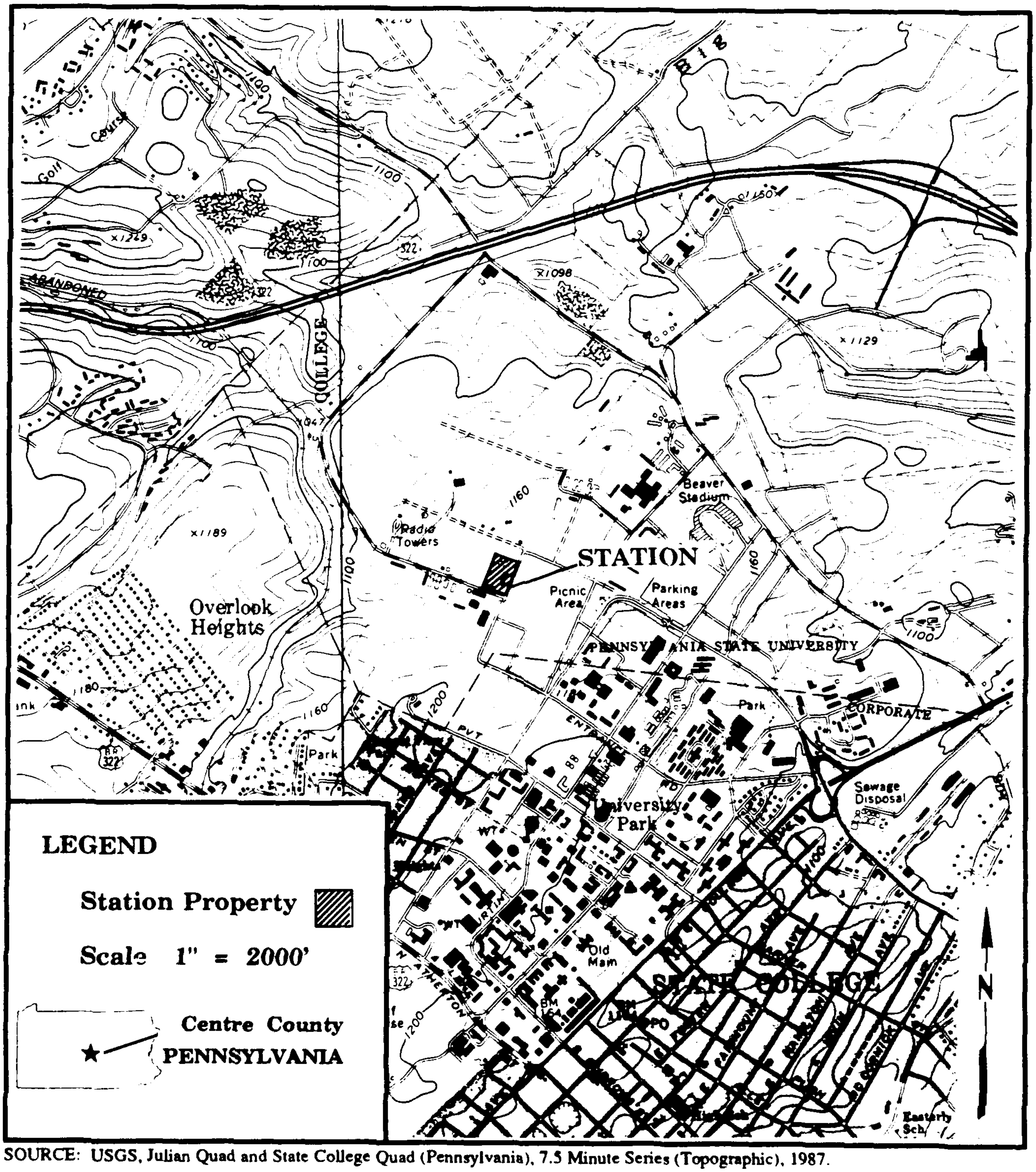
The Station is located at 551 Services Road just off the Bigler Road Extension on a parcel of land owned by PSU in the northern portion of the city of State College and in Centre County, Pennsylvania. The Station is rectangular in shape and is situated on level property. Elevation of the Station is 1172 feet above mean sea level (AMSL). Figure II.1 illustrates the location and boundaries of the Station.

The Station occupies a total of 2.9 acres and contains four permanent structures with a fifth one under construction. The main facility (Building 01) houses the 112th TCS and their respective administrative functions. The second facility is the warehouse (Building 02) that is used for storage and for housing both a mess facility and a dedicated area for the 114th ATCF. The Vehicle Maintenance Building (Building 03) supports all motor vehicle maintenance performed on the Station. The fourth building (Building 04) is used for aerospace ground equipment (AGE) maintenance activities. A metal storage building is due for completion in the near future. The population of the Station during the week numbers 30 members. Unit Training Assembly occurs one weekend per month. The Station population during this weekend is 138 members.

B. Organization and History

In 1949, the property for the State College ANG Station was leased from PSU. The three principal buildings were completed in 1949 while the AGE building was completed in 1975. Additional structures include a small generator building, a medical trailer, and a prefabricated metal storage building that is presently under construction. Prior to the construction of the Station, the property was unimproved. Operations at the Station commenced in 1949. The Station is occupied by two organizations: the host unit, the 112th TCS; and the tenant unit, the 114th ATCF.

The 112th TCS is the primary generator of waste materials on the Station, whereas the 114th ATCF produces nominal amounts. The 112th TCS was created on April 1, 1949, and took possession of the Station upon completion of the three original buildings. The 112th TCS was originally organized as the 112th Aircraft Control and Warning Squadron. The mission of the 112th TCS is that of a Forward Air Control Post, which provides radar control for aircraft support of ground forces and for interceptor aircraft for protection of all forces in an assigned area of responsibility in support of Tactical Air Operations.



SOURCE: USGS, Julian Quad and State College Quad (Pennsylvania), 7.5 Minute Series (Topographic), 1987.

Figure II.1

Location Map of the State College Air National Guard Station

Their mission has not changed significantly over the past 41 years. Improvements in the mission have been made through advancements in technology.

The 114th ATCF joined the Station in 1982. During the week, the seven members of the 114th ATCF are under the direct control of the 112th TCS; however, during the weekend, a full complement of 46 members makes up the 114th ATCF. The mission of the 114th ATCF is to provide air traffic control and landing systems support for operational commands; locate and identify approaching aircraft; and instruct pilots in guiding their aircraft to a safe landing, especially during conditions of reduced visibility. This mission has not changed significantly except for equipment improvements.

The 112th TCS was the first organization at the Station, and because of their mission, a degree of maintenance has always been performed at the Station. The repair and servicing of motor vehicles and AGE items have taken place on the property over the past 41 years. One underground storage tank (UST) exists for heating oil, and several small above ground tanks, both stationary and mobile, are used for jet fuel (JP-4) and waste products. No oil/water separators are located on the property. A sump/dry well that collects and dissipates drainage from the wash rack aids in the prevention of property degradation.

Materials recognized as hazardous today have been generated on this property since the establishment of the Station. With the awareness of hazardous materials and the recognition of their impact on the environment, acceptable disposable practices and procedures have evolved. The majority of hazardous wastes are now collected and disposed of through contractors and the Defense Reutilization and Marketing Office (DRMO).

III. ENVIRONMENTAL SETTING

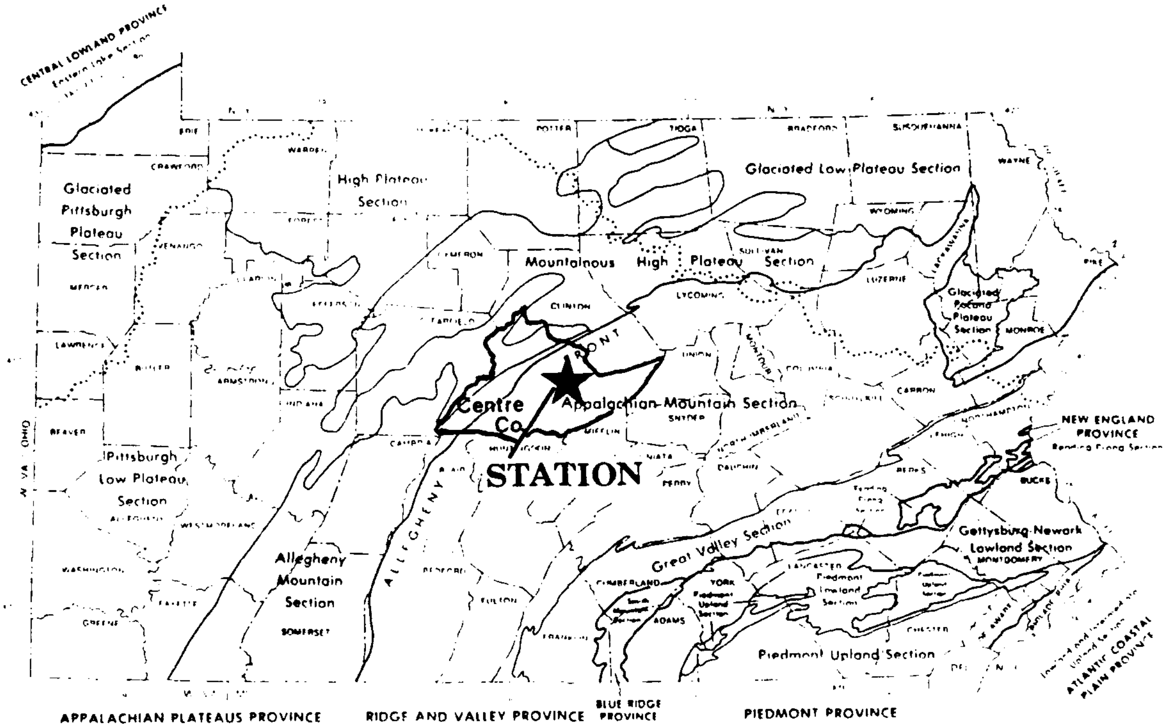
A. Meteorology

The following climatological data is largely derived from the National Climatic Data Center, Ashville, North Carolina. It is published in the Soil Survey of Centre County, Pennsylvania (United States Department of Agriculture (USDA): Soil Conservation Service, 1981), the Climatic Atlas of the United States (United States Department of Commerce National Climatic Center, Ashville, North Carolina, 1979), and The State Water Plan Subbasin 9 Central West Branch Susquehanna River (Commonwealth of Pennsylvania, 1980). Centre County is characterized by a climate composed of relatively dry continental air and more humid eastern seaboard conditions. Summers are mild and winters are cold, with precipitation being fairly evenly distributed throughout the year. The total average annual precipitation, based on an 89-year record (1885 to 1974), was 38.27 inches at State College (Wood, 1980). Based on a 29-year record (1941-1970) at State College, precipitation ranges from an average monthly high of 4.03 inches in May to an average monthly low of 2.05 inches in February. By calculating net precipitation according to the method outlined in the Federal Regulations CERCLA Pollution Contingency Plan (United States Environmental Protection Agency 55 FR 8813, Subpart K, March 8, 1990), a net precipitation value of 10 inches per year is obtained. The heaviest rainfall recorded was 6.73 inches on June 22, 1972, and the one-year, 24-hour rainfall for the area is approximately 2.25 inches. Precipitation occurs as showers and thunderstorms in the summer and as rain, sleet, and snow in the winter.

On the average, 30 to 60 inches of snow accumulate each year, and it covers the ground an average of 51 days in the winter. Precipitation and temperature vary within the county depending on surface elevation. The average annual temperature for the 29-year reporting period (1941-1970) was 49.65°F, and the average monthly temperature ranged from 71.8°F in July to 27°F in January. Prevailing wind direction is from the west in the winter and from the southwest in the summer. The average wind speed is 10 miles per hour.

B. Geology

Centre County is located in the Appalachian Plateaus and the Valley and Ridge physiographic provinces (Figure III.1). The northwest one-third of the county exists in the Appalachian Plateaus province while the southeast two-thirds occurs in the Valley and Ridge province. The two provinces are separated by the Allegheny Front which traverses through the north-central part of the county in a northeasterly orientation. Specifically, the Station is



LEGEND

Physiographic Sections and Provinces in the State of Pennsylvania

Scale

0 **50 mi.**

N

SOURCE: Pennsylvania Geologic Survey, Physiographic Province Map of Pennsylvania, Map 13, 1989.

Figure III.1

Physiographic Map of Pennsylvania

situated approximately 5.5 miles southeast of the Allegheny Front in the Valley and Ridge province. The Valley and Ridge province is composed of two sections that are named for their dominant topographic features. They are the Appalachian Mountain and the Great Valley sections. The portion of Centre County located in the Valley and Ridge province exists wholly in the Appalachian Mountain section.

The Appalachian Mountain section is characterized by long, narrow ridges alternating with broad to narrow valleys which are predominantly aligned northeast to southwest (Pennsylvania Geological Survey, 1989). The ridges and valleys originated as a result of lateral compressional forces from the southeast that folded, faulted, and uplifted the underlying Paleozoic rock sequence. Subsequent to uplifting, the area was eroded, and the more resistant rock units remained as ridges while the less resistant rock lithologies were carved into valleys. Ridge tops consist of hard clastic sedimentary rocks that are generally sandstones. Valleys are composed of soft carbonate sedimentary rocks and often exhibit karst topography where sinkholes and caverns are prevalent.

As a result of the valley and ridge topography, the relief in Centre County is moderate to very high. Surface elevations generally range from 900 to 1400 feet AMSL in the valleys and 1700 to 2200 feet AMSL along the crests of higher ridges (Wood, 1980). The Station is located in a relatively broad valley which is situated between Gatesburg Ridge and Nittany Mountain. At the Station location, the surface elevation ranges from 1172 to 1177 feet AMSL.

The bedrock in the Valley and Ridge province in Centre County consists of Cambrian, Ordovician, Silurian, and Devonian age deposits. These rock units are sedimentary in origin and consist of dolomite, limestone, sandstone, quartzite, conglomerate, and shale (Figure III.2). The Cambrian and Ordovician age rocks crop out in the valleys, and the Devonian rocks are exposed along the Allegheny Front. Silurian rock units form the high ridges immediately east of the Front, and Lower Silurian and Upper Ordovician rocks generally form the high ridges east of the Allegheny Mountain sections. In the vicinity of the Station, rocks of the Lower Ordovician age Beekmantown group and the Upper Cambrian age Gatesburg formation crop out (Figure III.3).

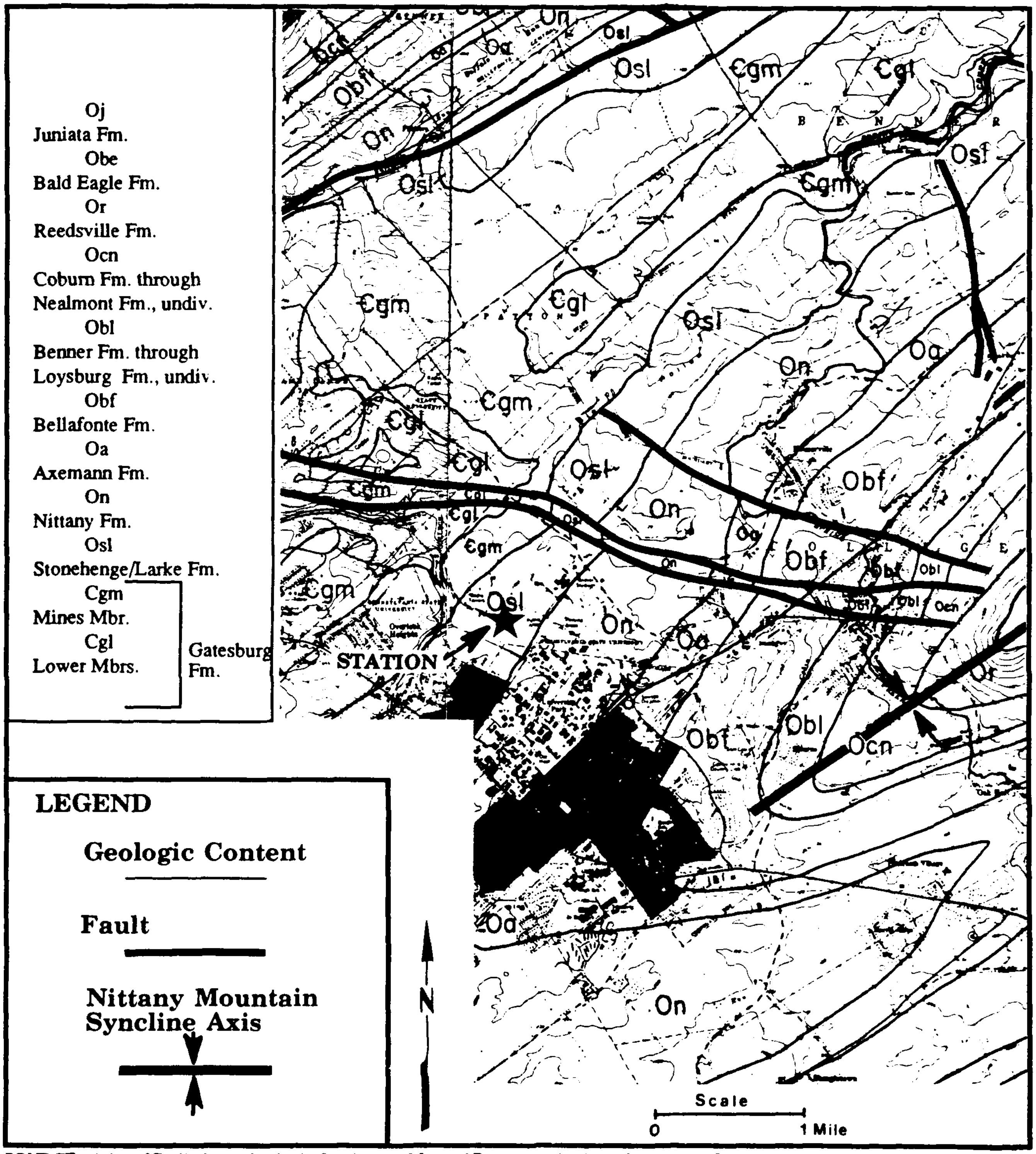
Specifically, the Station location is shown to be underlain by the Stonehenge/Larke formation which is the lower most member of the Beekmantown group (Pennsylvania Geological Survey, 1981). However, Lohman, 1938, reports that the Larke formation is generally absent in this part of Centre County, and a hiatus exists between the Stonehenge formation and the underlying Gatesburg formation. Therefore, the Stonehenge formation exists unconformably in contact with the Mines member of the Gatesburg formation. In addition, the Stonehenge formation is overlain by the Nittany formation of the Beekmantown group (Figure III.2). Both the Mines member

System	Geologic Unit	Thickness (feet)	Character of Strata	Water-bearing Characteristics
Ordovician	Juniata Formation	500-1000	Dominantly red, fine-grained sandstone, siltstone, and shale	Average well yield is about 25 gpm. Water is soft.
	Bald Eagle Formation	700-800	Brown to gray, fine- to coarse-grained sandstone.	Average well yield is about 20 gpm. Water is soft.
	Reedsville Formation	900-1400	Dark-gray to brownish-gray shale; somewhat calcareous near the base; sandy near the top.	Average well yield is about 30 gpm and yields range from 10 to 180 gpm. Water is generally of good quality and soft to moderately hard.
	Coburn Formation	300	Thin-bedded limestone containing shale interbeds.	Average well yield of the Trenton Group is about 10 gpm.
	Salona Formation	180-300	Thin-bedded limestone containing shale partings.	
	Nealmont Formation	70	Thin- to thick-bedded, impure limestone.	
	Benner Formation	150	Dark-gray, laminated, thick- to thin-bedded limestone.	Generally yields adequate water for domestic use. Many springs issue from this formation.
	Snyder Formation	80	Medium-bedded limestone and dolomite.	Generally yields adequate water for domestic use (3 to 10 gpm).
	Hatter Formation	75	Medium-bedded limestone and laminated, argillaceous and arenaceous dolomite.	Generally yields adequate water for domestic use (3 to 10 gpm).
	Loysburg Formation	50-450	Laminated, medium- to thin-bedded limestone and dolomite.	Generally yields adequate water for domestic use (3 to 10 gpm)
	Bellefonte Formation	1400	Light-gray thick bedded dolomite; some chert; sandstone bed in upper part.	Average yield is about 20 gpm; about one in four yields 300 gpm+. Some high capacity wells pump sand. Large springs issue from this formation. Good water quality generally.
	Axemann Formation	400-700	Blue, thin-bedded limestone; some dolomite.	Very little data available for wells. At least two large springs issue from this formation; solution channels are common. Good water quality; hard.
	Nittany Formation	1200	Blue, thick-bedded, coarsely crystalline dolomite.	Average yield is about 500 gpm. Less than 1/2 of wells pump sand or collapse. Yields very hard water.
	Stonehenge Formation	250-600	Blue, thin-bedded limestone; some dolomite.	Most wells yield adequate water for domestic use (3 to 10 gpm).
Cambrian	Gatesburg Formation	1800		
	Mines Member		Dark-gray coarse-grained dolomite; subordinate light-gray fine-grained dolomite.	Data available for one well (310 gpm). Probably an excellent aquifer.
	Upper Sandy Member		Dolomite and interbedded orthoquartzite and sandy dolomite.	Average yield of 415 gpm. But more than half pump sand or collapse. Not suited to development of domestic supplies. Water is of good quality but hard. Very little data is available for the lower members of the Gatesburg Formation.
	Ore Hill Member		Dark-gray dolomite.	
	Lower Sandy Member		Dolomite and interbedded orthoquartzite and sandy dolomite.	
	Warrior Formation	1300	Blue impure limestone and dolomite thin, sandy partings.	Yield data are available for only one well (12 gpm). Based on the data for this well and the lithology of this formation, it is probably a poor aquifer.

SOURCE: Wood, C. R., Summary Groundwater Resources of Centre County Pennsylvania, Pennsylvania Geological Survey, 1980.

Figure III.2

Generalized Stratigraphic Column of the Area



SOURCE: Atlas of Preliminary Geologic Quadrangle Maps of Pennsylvania, State College and Julian Quadrangles, Pennsylvania Geological Survey, Map #61, 1981.

Figure III.3

Surficial Geologic Map for the State College Air National Guard Station

and the Nittany formation are largely dolomite in composition. The Nittany formation crops out southeast of the Station approximately 0.25 miles, and the Mines member crops out approximately 0.33 miles northwest from the Station (Figure III.3). The Stonehenge formation is described as a relatively pure, blue limestone that is moderately fossiliferous and contains 6-inch to 6-foot beds of dolomite (Wood, 1981, and Lohman, 1938). A thin-bedded fossiliferous conglomerate and edgewise conglomerate are characteristic of the basal part (Butts and Moore, 1936). The thickness of the formation ranges from 250 to 600 feet in Centre County (Wood, 1981).

The geologic structure of the Valley and Ridge province is complex, with folding and faulting being the dominant structural features. As a result of the southeast-oriented compressional stress exerted on the region, the geologic strike is northeast to southwest. Consequently, fold axes and thrust faults are aligned parallel to the regional structural grain. Conversely, normal faults are generally oriented perpendicular to the strike direction. Folds are the most prolific structural features in Centre County with the Nittany and Penns Valley anticlines and the Nittany Mountain syncline being the most pronounced (Lohman, 1938).

The Station is situated along the northwest limb of the Nittany Mountain syncline (Figure III.3). The axis of the syncline is located approximately 3.5 miles east from the Station at the crest of Nittany Mountain. Along the crest of the mountain, the Upper Ordovician Juniata formation is exposed, and the rock units become progressively older from that point west toward the Station. At the Station location, the rock units likely dip to the southeast toward the axis of the syncline. No major thrust faults are mapped as occurring in the immediate vicinity of the Station; however, a series of significant normal faults is shown to exist approximately 0.75 miles northeast of the Station (Figure III.3).

The soils overlying the bedrock at the Station location are members of the Hagerstown series. These soils are deep, well-drained, and are formed in limestone residuum. Hagerstown soils occur in association with upland areas of limestone valleys and are nearly level to very steep. The majority of the Station property is underlain by the Hagerstown silt loam with 0 to 8 percent slopes (HaA and HaB). A small part of the southwest corner of the property is underlain by the Hagerstown silty clay loam at 3 to 8 percent (HcB). The HaA, HaB, and HcB soils are nearly level to gently sloping soils that are classified as having moderate permeability (0.63 to 2.00 inches per hour or 4.45 x 10^{-4} to 1.41 x 10^{-3} cm/sec) throughout. A representative profile of these soils would have a silt loam surface layer with a silty clay, clay, and silty clay loam subsoil. The substratum is composed of a clay loam. The average depth to bedrock is approximately 75 inches, but it can range from 3.5 to 7 feet. Sinkholes are common in the areas where these soils occur. The information pertaining to soils contained in this text was compiled from the Soil Survey of Centre County, Pennsylvania (USDA: Soil Conservation Service, 1981).

C. Hydrology

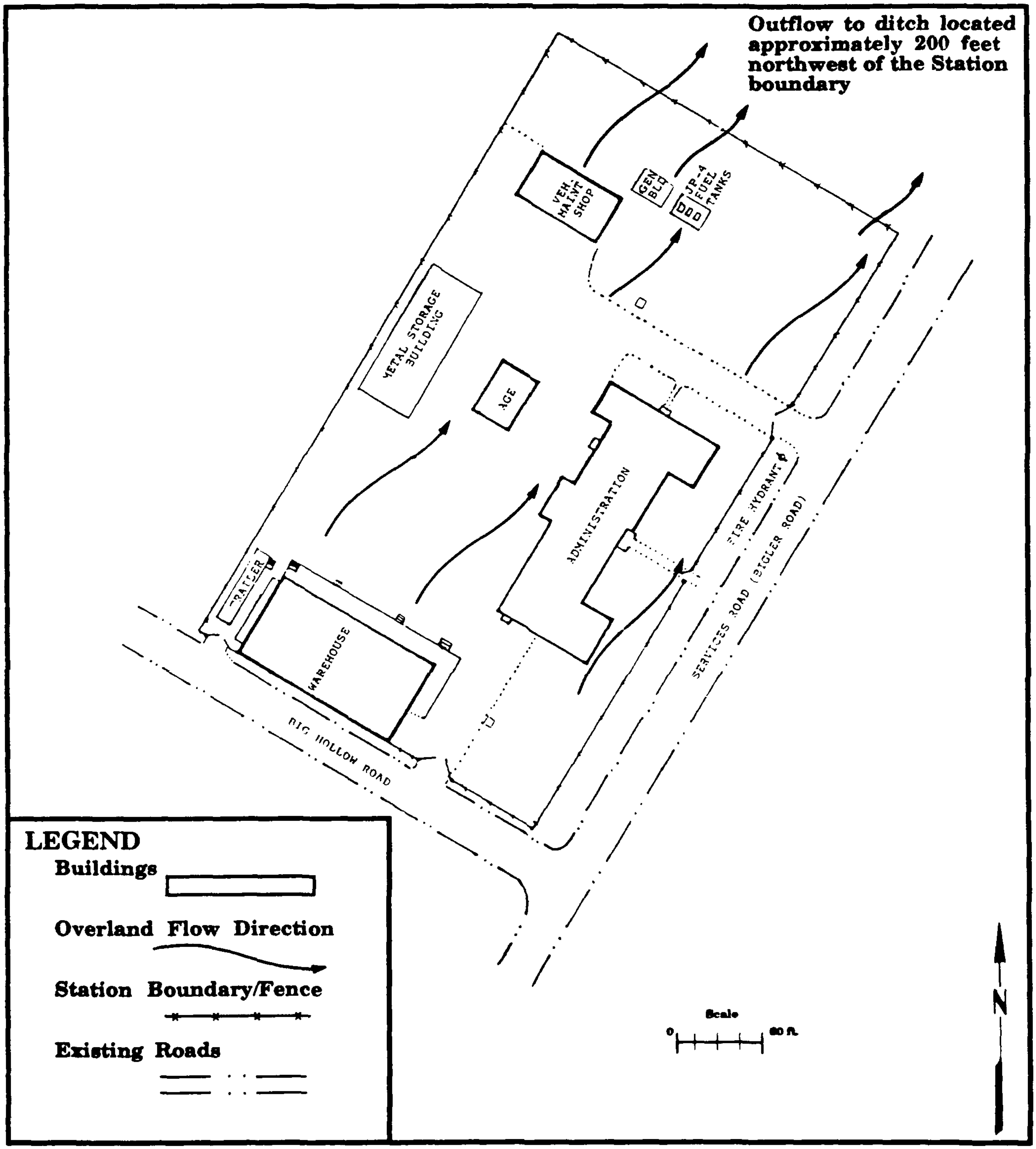
1. Surface Water

The Station property is drained to the northeast by overland sheet flow, and surface water outflows the property along the northeast boundary (Figure III.4). Outside the Station boundary, flow continues overland northeastward approximately 200 feet where it is collected in an open ditch located along University Drive Extension (Figure III.5). The ditch flows northwest along University Drive approximately 800 feet before turning southwesterly and flowing approximately 750 feet to Big Hollow Road. Flow continues under Big Hollow Road approximately 1200 feet to a surface water retention basin. Surface water is contained in the basin until it percolates into the groundwater system. According to personnel at the PSU Physical Plant, the basin is designed to provide additional recharge to the aquifer at that location. The Station is located in the Spring Creek drainage basin along the headwaters of Big Hollow Creek. Surface water in the vicinity of the Station, that is not collected in the PSU surface water retention basin, is drained northeast approximately four miles to Spring Creek via Big Hollow Creek. Spring Creek also drains the area around State College and the area north to Bald Eagle Creek. Big Hollow Creek empties into Bald Eagle Creek and ultimately into the West Branch of the Susquehanna River. The Station is located outside the 100-year flood plain (Federal Emergency Management Agency, 1989).

2. Groundwater

The principal aquifers in Centre County are the carbonate rocks which underlie the valleys. Generally, the carbonate rocks in the area contain very little primary porosity and permeability (Lohman, 1938). Consequently, the occurrence and movement of groundwater is determined by the development of secondary porosity and permeability. Secondary porosity and permeability is developed through fracturing of the bedrock and by dissolution of soluble carbonate rocks. Fracturing of the bedrock is widespread and is caused by structural deformation that is characteristic of the region. Therefore, the carbonate rocks will yield at least small quantities of water at most locations. However, the occurrence of large quantities of groundwater is associated with secondary porosity and permeability derived from dissolution.

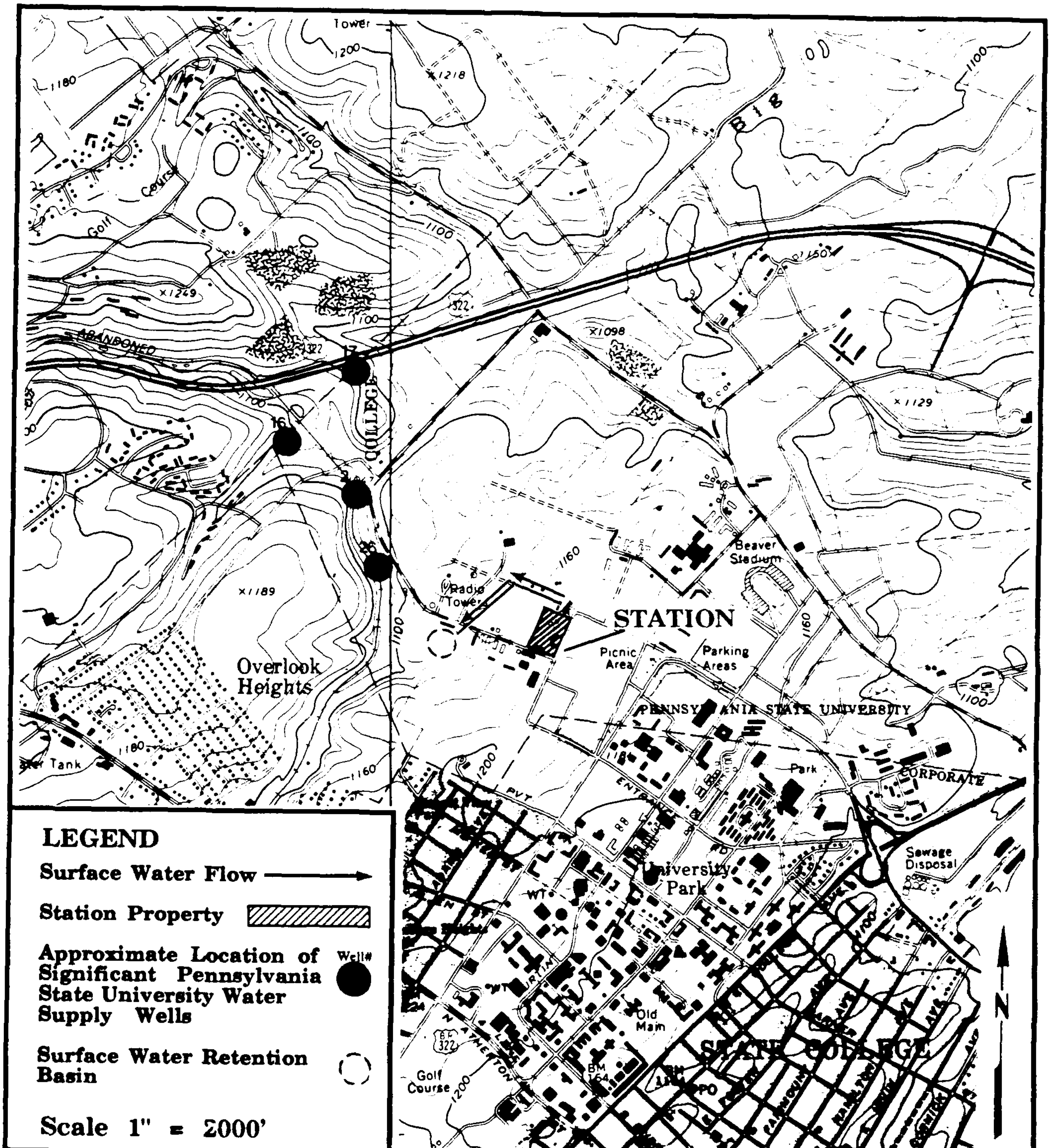
The development of secondary porosity and permeability through dissolution occurs along and enlarges the pre-existing voids created by fracturing. Fracture traces in the State College area are abundant and generally have north-south and east-west lineations (Wood, 1980). Surface water forms a weak acidic solution as it percolates through the soil layers. As the water continues its downward movement through the fracture system, toward the water table, the fractures are enlarged in response to dissolution of the adjacent rock. Dissolution of the carbonate material continues below the water



SOURCE: State College ANG Station Base Plans.

Figure III.4

Surface Water Drainage Map of the State College Air National Guard Station



SOURCE: USGS, Julian Quad and State College Quad (Pennsylvania), 7.5 Minute Series (Topographic), 1987.

Figure III.5

Surface Water Flow Route Map

table and is a result of the circulation of the groundwater. Lohman, 1938, suggests that dissolution by circulating groundwater is generally greater at shallow depths in association with the fluctuating water table. Therefore, the amount of solutional voids is believed to decrease with depth. However, Wood, 1980, reports that water yields from wells increase with depth. This is believed to be attributed to the increase in number of water yielding zones encountered in a deep well, rather than the occurrence of better developed zones. Most of the high yielding water zones occur within the land surface and down to 400 feet (Wood, 1981), and Siddiqui, 1969, reported that almost no fractures or solutional openings were observed below 500 feet at a location in Centre County. Limestone is generally more soluble than dolomite, but dolomites are generally better aquifers. This is related to the size of impurities contained in the rock. The dolomites have larger grain sizes than the fine-grained limestones and, therefore, form larger void spaces when dissolved. The Lower Ordovician and Cambrian age rocks are relatively sandy and, consequently, yield large volumes of water (Wood, 1980).

The development of secondary porosity and permeability through fracturing and dissolution results in the formation of a very intricate network for groundwater movement. Furthermore, sinkholes form in response to collapse features and vertical joints in the rocks and provide for a more direct recharge of the groundwater systems from surface water (Lohman, 1938). Where the groundwater networks are developed extensively, surface water has an almost direct route to the water table. The systems can become developed to the degree that they function as underground drainage systems, comparable to surface drainage systems. Therefore, it is possible for large volumes of groundwater to be transported over a significant distance in a relatively short period of time. An estimated 86 percent of the total runoff occurs through the groundwater system in the Spring Creek basin (Giddings, 1974). Consequently, the carbonate aquifers can be recharged locally by precipitation and surface runoff or by groundwater that has traveled a considerable distance. Recharge of the aquifers in the vicinity of the Station, at least partially, likely occurs on a localized basis from infiltration of precipitation and surface water runoff collected in the PSU surface water retention basin.

Groundwater movement within the carbonate aquifers is generally unconfined within the limits of the fractured and solutional network; however, artesian conditions do occur (Wood, 1980). General groundwater movement can be inferred from topography, and local flow directions are interpreted as occurring perpendicular to surface elevation contours oriented toward low lying areas or stream valleys. However, factors such as the dip of the formations, cones of depression produced by large withdrawals from wells, and sinkholes can affect groundwater movement locally. The direction of shallow groundwater movement at the Station is interpreted from topography as being in a general west-northwesterly direction, toward the headwaters of Big Hollow Creek. Large withdrawals from the water table by PSU well #26, located west-northwest from the Station, possibly enhances local groundwater movement in this direction due to the formation of a cone of depression in the water table surface. Consequently, the direction of groundwater movement at the Station is assumed to be to the west-northwest in the direction of PSU well #26. However, general groundwater movement in the vicinity of PSU is in an overall northerly direction, as interpreted from the water table map of the Spring Creek basin compiled by Wood, 1980.

The water table at the Station location is interpreted from Wood, 1980, as occurring at approximately 985 feet AMSL or 190 feet below the land surface in the Stonehenge formation. Information on static water levels published in Wood, 1980, for the closest wells in relation to the Station also indicate an average water table level of 1000 feet AMSL at this location. However, it should be noted that the water table fluctuates seasonally, and the low levels occur in April through October each year. In addition, water table levels likely fluctuate locally depending on the withdrawals of water by pumpage of the nearest PSU water wells.

In the vicinity of the Station, the Gatesburg formation is the principal aquifer. The Gatesburg formation is one of the highest yielding aquifers in Centre County with the median well yield reported at 415 GPM (gallons per minute). The high yields and high permeability are associated with the dolomitic composition of the Gatesburg, along with the occurrence of medium- to coarse-grained beds of orthoquartzite. Water levels in the Gatesburg are generally deep, and wells producing from the Gatesburg are commonly 300 feet or more below the land surface (Wood, 1980). Wells constituting the PSU water supply system primarily produce from the Gatesburg formation. Wells #26 and #2 of the PSU system are the closest wells in relation to the Station (Figure III.5). Both produce from the Gatesburg and are located 0.45 miles and 0.60 miles west-northwest from the Station, respectively. Well #26 was drilled to a total depth of 400 feet below the land surface and well #2 to a depth of 330 feet below the land surface. Records obtained from PSU indicate well #26 was capable of producing 1.2 million GPD (gallons per day) in 1989 while well #2 produced 0.634 million GPD. In addition, records show a concentration of perchloroethylene was found in these wells; therefore, they are used only on a limited basis. The Stonehenge formation immediately underlying the Station is not developed as a water source in this area, and no wells are reported to be screened in the immediate vicinity of the Station. Commonly, the Stonehenge is not capable of yielding large volumes of water and is used for domestic purposes only.

The susceptibility of groundwater to contamination at the Station location is considered to be moderately high to high risk, should a release occur. This conclusion stems from the occurrence of groundwater in a fractured and cavernous network and the recharge of that system locally by surface water. Furthermore, the Station is located in close proximity to supply wells of the PSU system, and the general groundwater movement is likely in the direction of the nearest well. Concern exists for the induction of surface water runoff into the groundwater via the surface water retention basin located downstream of the Station. According to sources at PSU, the retention basin is designed to provide additional recharge to the aquifer at that location and therefore counter the effects of pumpage from well #26. In addition, it is important to note that a sump/dry well exists for dispersion of waste water from the wash rack area on the Station property.

D. Critical Habitats/Endangered or Threatened Species

According to current records maintained by the Pennsylvania Game Commission, Pennsylvania Fish Commission, and Pennsylvania Natural Diversity Inventory (Bureau of Forestry - Forest Advisory Services), no endangered or threatened species of flora or fauna have been identified within a 1-mile radius of the potential sites at the Station. There are no designated critical habitats in this area. However, in 1988 a population of *Amelanchier humilis* (low serviceberry), a rare plant under study for possible state listing as an endangered or threatened species in Pennsylvania, was identified within the 1-mile radius and near the intersection of Big Hollow Run and old U.S. Route 322. Two other rare plant species, *Arabis hirsuta* (western hairy rock-cress) and *Ranunculus fascicularis* (tufted buttercup), would normally use the same habitat as that of the low serviceberry, but they have not been rediscovered from historic collections in the area.

A small wetland area is located one mile northwest of the Station [United States Fish and Wildlife Service, National Wetlands Inventory Map (Julian, Pennsylvania Quadrangle)].

A surface water retention basin that provides aquifer recharge is located approximately 1800 feet west of the Station. Surface water drainage from Site No. 1 - Surface Waste Disposal Area flows to this basin. Groundwater is also believed to be recharged at Site No. 2 - Sump/Dry Well. Given the presence of these recharge areas within a 1-mile radius of the Station, a Factor Rating of 3 is used to calculate Hazard Assessment Scores (HAS).

IV. SITE EVALUATION

A. Activity Review

A review of Station records and interviews with personnel were used to identify specific operations in which the majority of hazardous materials and/or hazardous wastes are used, stored, processed, and disposed. Table IV.1 provides a history of waste generation and disposal for operations conducted by shops at the Station. If an item is not listed on the table on a best-estimated basis, that activity or operation produces negligible (less than 1 gallon/year) waste requiring disposal.

PSU has a potable water system that is separate from the municipal system of State College. The water in this system is from local wells. Since the Station is located on university property, its potable water is supplied by PSU. There are no water wells within the Station's boundaries.

Sewage from the Station is not treated at a municipal wastewater treatment plant. It drains to a 15,000 gallon septic tank and leach field located just outside of the boundary fence and immediately northwest of the Trailer facility.

B. Disposal/Spill Site Information, Evaluation, and Hazard Assessment

Seven persons were interviewed to identify and locate potential sites that may have been contaminated by hazardous wastes as a result of past Station operations. Two potentially contaminated sites (Site No. 1 - Surface Waste Disposal Area and Site No. 2 - Sump/Dry Well) were identified through the interviews. These identifications were followed by visual examinations of the sites and/or the areas surrounding them.

These sites were rated by application of the United States Air Force (USAF) HARM (Appendix B), and since the potential for contaminant migration exists at these sites, they are recommended for further investigation under the IRP program. A copy of the completed HARM forms and an explanation of the factor rating criteria used for site scoring are contained in Appendix C.

The potential exists for contaminant migration at the rated sites. Contaminants that may have been released at these sites have the potential to be transported by groundwater and/or surface water. The water table, which averages 190 feet below the ground surface, has the highest risk of contamination. The fractured and cavernous nature of the bedrock can provide ready access to the water table for contaminants. Additionally, released contaminants that are exposed on the ground surface at Site No. 1 have the potential to be transported by surface water migration into a surface water retention basin that is designed to recharge the aquifer at its location.

Table IV.1 Hazardous Materials/Hazardous Wastes Disposal Summary: State College Air National Guard Station, State College, Pennsylvania.

Shop Name and Location	Possible Hazardous Wastes	Estimated Quantities (Gallons/Year)	Method of Disposal (1949 → 1990)
Vehicle Maintenance (Bldg. 003)	Engine Oil	600	ABR | ABR/FTA | FTA | CONTR
	Battery Acid	8	UNK | NEUT/SEP
	Ethylene Glycol	20	UNK | WR/PU
	Lubricating Oil	3	ABR | ABR/FTA | FTA | CONTR
	Transmission Fluid	2	NIU | FTA | CONTR
	Lacquer Thinner	8	NIU | EVAP/RAGS/TRASH
	Diesel Fuel	20	NIU | ABR | ABR/FTA | FTA | CONTR
	Bearing Grease	10 Lbs	ABR | ABR/FTA | FTA | CONTR *
	Paint (containers)	20	NIU | TRASH
	Parts Cleaner	130	UNK | ABR/FTA | FTA | CONTR

* Besides the disposal codes indicated, bearing grease was disposed via RAGS/TRASH during the whole timeframe.

KEY:

ABR - Material applied to Bigler Road, now Service Road, to settle dust.
CONTR - Disposed of through a contractor.
DRMO - Disposed of through the Defense Reutilization & Marketing Office. (Prior to 1986, this office was known as the Defense Property Disposal Office (DPDO).)
EVAP - Material disposed of by evaporation.
GRND - Material disposed of on the ground.
FTA - Material sent to an off-Station fire training area owned by the Borough of State College and used by the Alpha Fire Department and occasionally by the Station.
NEUT - Material neutralized with a chemical agent.
NIU - Material was not in use at this time.
NLU - Material no longer used.
PU - Picked up for personal use by local citizens.
RAGS - Material wiped onto rags.
SEP - Disposed of in drains connected to the Station's septic tank.
TRASH - Disposed of in trash that goes to city landfill.
UNK - Disposal method is unknown.
WR - Disposed of through the drain at the vehicle wash rack.

Table IV.1 Hazardous Materials/Hazardous Wastes Disposal Summary: State College Air National Guard Station, State College, Pennsylvania (continued).

Shop Name and Location	Possible Hazardous Wastes	Estimated Quantities (Gallons/Year)	Method of Disposal (1949 – 1960 – 1970 – 1980 – 1990)
Aerospace Ground Equipment (AGE) Maintenance (Bldg. 004)	Engine Oil	20	UNK — CONTR
	Paint Thinner	10	UNK — GRND — DRMO
	JP-4	20	NIU — FTA — DRMO
	Parts Cleaner	40	NIU — DRMO — CONTR
	MOGAS (Leaded)	5	UNK — GRND — NLU
	Battery Acid	4	UNK — NEUT/SEP
	7808 Oil	20	NIU — DRMO
	Diesel Fuel	5	UNK — GRND — DRMO
	Carbon Cleaner	2	NIU — WR
	Ethylene Glycol	5	UNK — WR
	Bearing Grease	1 Lb.	UNK — RAGS/TRASH
	Xylene	5	UNK — GRND — NLU

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NEUT	- Material neutralized with a chemical agent.
NIU	- Material was not in use at this time.
NLU	- Material no longer used.
PU	- Picked up for personal use by local citizens.
RAGS	- Material wiped onto rags.
SEP	- Disposed of in drains connected to the Station's septic tank.
TRASH	- Disposed of in trash that goes to city landfill.
UNK	- Disposal method is unknown.
WR	- Disposed of through the drain at the vehicle wash rack.

Table IV.1 Hazardous Materials/Hazardous Wastes Disposal Summary: State College Air National Guard Station, State College, Pennsylvania (continued).

Shop Name and Location	Possible Hazardous Wastes	Estimated Quantities (Gallons/Year)	Method of Disposal 1949	1960	1970	1980	1990
Communications Maintenance Shop (Bldg. 002)	Trichloroethylene	4		UNK	GRND/WR	NLU	
	Naphtha	4		UNK	GRND/WR	NLU	
Radar Maintenance Shop (BLDG. 002)	Carbon Tetrachloride	1	UNK	GRND		NLU	
	Trichloroethylene	1		UNK		GRND	NLU
	Transformer Oil	7	UNK		TRASH/ABR		DRMO
	Xylene	1	UNK		GRND		
	7808 Oil	1	UNK		NIU		DRMO
	Ethylene Glycol	3.5	UNK		NIU		WR

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NEUT - Material neutralized with a chemical agent.
NIU - Material was not in use at this time.
NLU - Material no longer used.
PU - Picked up for personal use by local citizens.
RAGS - Material wiped onto rags.
SEP - Disposed of in drains connected to the Station's septic tank.
TRASH - Disposed of in trash that goes to city landfill.
UNK - Disposal method is unknown.
WR - Disposed of through the drain at the vehicle wash rack.

The locations of the potential sites are provided on Figure IV.1. Descriptions of the potential sites identified at the Station follow:

Site No. 1 - Surface Waste Disposal Area (HAS - 74)

Site No. 1 measures approximately 70 feet x 70 feet and is bounded by the Vehicle Maintenance Shop, Generator Building, JP-4 fuel tanks, and the access road leading into the Station. It consists of two distinct subareas: the Old Waste Holding Area and the Surface Disposal Zone (Figure IV.1).

The Old Waste Holding Area measures approximately 25 feet x 15 feet and is located adjacent to the Vehicle Maintenance Shop and Generator Building. Waste engine oil, brake fluid, and diesel fuel were stored in drums at this location from the early 1950s until 1980. An estimated five gallons of waste were spilled in this area each year. This would indicate a cumulative spill quantity of 150 gallons. Painting was also done in this area.

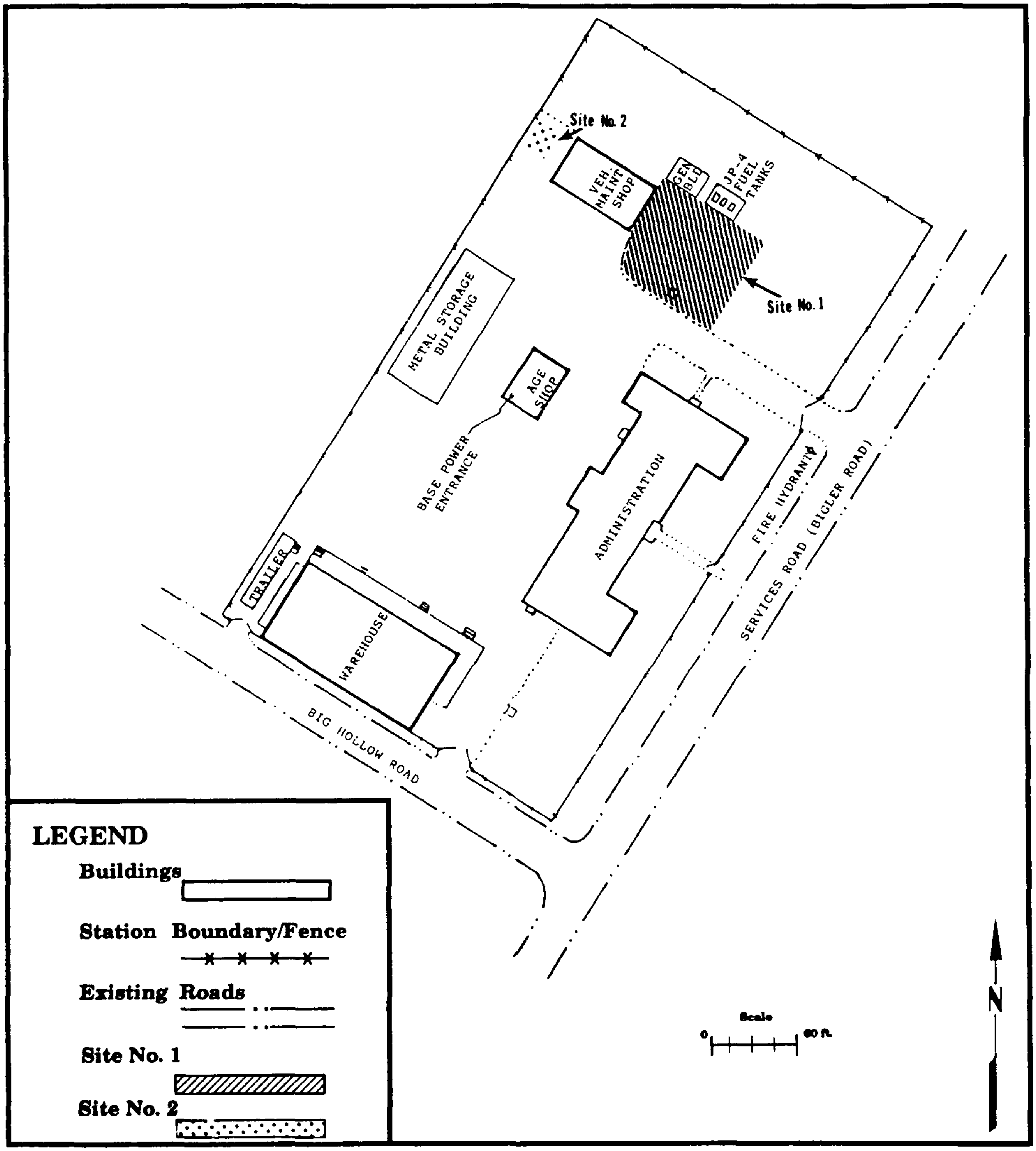
The Surface Disposal Zone coincides with the current gravel area east of the Vehicle Maintenance Shop and includes the gravel portion of the Old Waste Holding Area. From at least 1955, and probably before that time, until the present, a variety of waste materials has been disposed of on the gravel surface. These materials include trichloroethylene, naphtha, carbon tetrachloride, xylene, paint thinner, leaded MOGAS, and diesel fuel. An estimated 925 gallons of these wastes may have been disposed of at this location.

It is estimated that a total of 1075 gallons of liquid wastes were spilled or disposed of at this site. Petroleum product stains are evident in the area. Since there is a potential for soil and groundwater contamination from these wastes, a HAS was calculated for the site.

Site No. 2 - Sump/Dry Well (HAS - 64)

Site No. 2 is associated with a subsurface structure located approximately eight feet northwest of the motor vehicle wash rack adjacent to the Vehicle Maintenance Shop. Certain elements of this structure and certain aspects of its function are unknown, and solutions to these unknowns are key to providing the structure with a terminological referent and to delineating the potential site.

The general function of this structure appears to be the collection, holding, and dissipation of liquids that flow into the drain at the vehicle wash rack. How it performs the dissipation function is open to question. If it has a soil bottom and liquids are dissipated by their direct movement into the soil and groundwater, the structure could be termed a dry well. In this case, barring possible leaks through the structure's walls, the potential site would consist primarily of the soil at its bottom.



SOURCE: State College ANG Station Base Plans.

Figure IV.1

Potential Sites

at the State College Air National Guard Station

On an engineering drawing of Station facilities, the subsurface structure is referred to as a sump. For purposes of this discussion, the structure is hereinafter referred to as the sump/dry well.

Given the sump designation on the engineering drawings and the likelihood that any connection of the wash rack drain to the septic tank would have been made by a direct pipeline, the dry well hypothesis is preferred in this site description, and site delineation is confined to the hypothetical soil bottom of the sump/dry well and to the soil immediately surrounding the structure. This potential site designation is made with the recommendation that any additional IRP work focus initially on physically determining whether or not the sump/dry well has a soil bottom and on whether or not there is a connection to the septic system.

The shape of the sump/dry well is believed to approximate that of a vertically oriented cylinder. Its inside diameter is five feet, and its dry stone walls are one foot thick. It has a reinforced concrete slab top, and as already noted, it may have a soil bottom. The sump/dry well is located seven feet below the present grade.

The available engineering drawing suggests that a subsurface pipeline about 15 feet in length connects the wash rack drain to the sump/dry well. It is believed that the sump/dry well was installed exclusively to receive and dissipate liquids draining from the wash rack.

Between 1955 and 1957, the vehicle wash rack was installed. The sump/dry well may have been installed at the same time. However, its exact date of installation, the duration of its use, and whether or not it is still connected to the wash rack drain remains unknown.

An interviewee estimated that small but unknown quantities of ethylene glycol were incidentally washed down the wash rack drain over a period of approximately 35 years. It was also estimated that very small quantities of trichloroethylene and naphtha were washed down the wash rack drain during the cleaning of electronic equipment such as the Station's teletype machine. This occurred between 1966 and 1972. According to Station personnel, perchloroethylene (PCE) [also known as tetrachloroethylene], another common solvent once used generally as a degreasing agent when cleaning vehicles and as a cleaner for electronic equipment, was not used by the Station.

During the field survey, the interior of the sump/dry well could not be observed for signs of possible contamination. The sump/dry well location is covered by pavement. However, the wash rack was clean.

Since there is a potential for soil and groundwater contamination from the wastes that may have entered the sump/dry well, a HAS was calculated for this potential site.

C. Other Pertinent Facts

- o Trash and nonhazardous solid wastes from the Station are disposed of by PSU.

- o No abandoned or leaking USTs were identified at the Station.

- o Since about 1980, waste oil from the Vehicle Maintenance Shop has been stored in aboveground tanks.

- o There are no oil/water separators at the station.

- o Services Road is the main thoroughfare leading to the Station. Until recently it was known as Bigler Road. From 1949 until the late 1970s, Station personnel sprayed this dirt- and cinder-covered road with waste petroleum products to settle dust. The road is now paved. PSU is the owner of the road, and the Station has not been its sole user.

- o Two banks of pole-mounted power utility transformers are located along the northwest fence line. One bank is about 35 feet northwest of the Vehicle Maintenance Shop, and the other is approximately 20 to 30 feet southwest of the Metal Storage Building. The poles supporting these banks are immediately outside the fence, but one transformer in each bank overhangs the Station fence such that any spilled dielectric oil would fall onto Station lease property. These banks were installed in the 1960s and 1970s, and they are owned and maintained by the West Penn Power Company. The bank near the Vehicle Maintenance Shop may have been upgraded in the middle 1980s.

  None of the transformers in these banks have blue sticker labels. According to the West Penn Power Company, this would indicate that their dielectric oil has never been tested for polychlorinated biphenyls (PCBs). Interviewees at the Station did not recall any leaks from these transformers.

  Since 1980, a transformer using electrical insulating oil has been a major component of the radar equipment at the Station. The oil in the transformer has never been tested for PCBs. No leaks have been associated with this transformer.

  There are no power utility capacitors at the Station.

- o A National Pollutant Discharge Elimination System (NPDES) permit is not required of the Station.

- The Station does not have a Spill Prevention, Control, and Countermeasures (SPCC) Plan. Emergency Action Checksheet #3B, dated April 1, 1984, is the Station's current procedure for responding to a fuel spill. Plans are underway to include the station under the SPCC Plan for the 193rd Special Operations Group, Pennsylvania Air National Guard, Harrisburg, Pennsylvania.

V. CONCLUSIONS

Information obtained through interviews with Station personnel, reviews of records, and field observations was used to identify possible spill or disposal sites on the Station property. Two potentially contaminated sites were identified.

The following sites exhibit the potential for contaminant migration through surface water, soil, and/or shallow groundwater:

Site No. 1 - Surface Waste Disposal Area (HAS - 74)

Site No. 2 - Sump/Dry Wall (HAS - 64)

VI. RECOMMENDATIONS

The PA identified two potentially contaminated sites. As a result, additional work under the IRP is recommended for these sites to confirm the presence/absence of contamination.

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GLOSSARY OF TERMS

ALLOCHTHONOUS - Said of rocks or materials formed elsewhere than in their present place; of foreign origin.

ALLUVIAL - Pertaining to or composed of alluvium or deposited by a stream or running water.

ALLUVIUM - A general term for detrital deposits made by streams on river beds, flood plains, and alluvial fan. The term applies to stream deposits of recent time.

ANNUAL PRECIPITATION - The total amount of rainfall and snowfall for the year.

ANTICLINE - A fold, generally convex upward, whose core contains the stratigraphically older rocks.

AQUICLUDE - A body of rock that will absorb water slowly but will not transmit it fast enough to supply a well or spring.

AQUIFER - A body of rock that is sufficiently permeable to conduct groundwater and yield economically significant quantities of water to wells and springs.

ARGILLACEOUS - Like or containing clay.

ARTESIAN AQUIFER - A water-bearing bed that contains water under hydrostatic pressure.

BASIN - (a) A depressed area with no surface outlet; (b) A drainage basin or river basin; (c) A low area in the Earth's crust, of tectonic origin, in which sediments have accumulated.

BAY - A wide, curving open indentation, recess, or inlet of a sea or lake into the land or between two capes or headlands, larger than a cove, and usually smaller than, but of the same general character as a gulf.

BED [stratig] - The smallest formal unit in the hierarchy of lithostratigraphic units. In a stratified sequence of rocks, it is distinguishable from layers above and below. A bed commonly ranges in thickness from a centimeter to a few meters.

BEDDING [stratig] - The arrangement of sedimentary rock in beds or layers of varying thickness and character.

BEDROCK - A general term for the rock, usually solid, that underlies soil or other unconsolidated, superficial material.

BOULDER - A detached rock mass larger than a cobble, having a diameter greater than 256 mm, being somewhat rounded or otherwise distinctly shaped by abrasion in the course of transport.

CALCAREOUS - Containing calcium carbonate.

CARBONATE - (a) A mineral compound characterized by a fundamental anionic structure of CO_3^{-2}. (b) A sediment formed of the carbonates of calcium, magnesium and/or iron, e.g. limestone and dolomite.

CLASTIC - Pertaining to a rock or sediment composed principally of fragments derived from pre-existing rocks or minerals and transported some distance from their places of origin.

CLAY [soil] - A rock or mineral particle in the soil having a diameter less than 0.002 mm (2 microns).

CLAY [geol] - A rock or mineral fragment or a detrital particle of any composition smaller than a fine silt grain, having a diameter less than 1/256 mm (4 microns).

COARSE-TEXTURED (light textured) SOIL - Sand or loamy sand.

CONE OF DEPRESSION - The depression of heads around a pumping well caused by the withdrawal of water.

CONFINED AQUIFER - An aquifer bounded above and below by impermeable beds, or by beds of distinctly lower permeability than that of the aquifer itself.

CONGLOMERATE - A coarse-grained sedimentary rock, composed of rounded pebbles, cobbles, and boulders, set in a fine-grained matrix of sand or silt, and commonly cemented by calcium carbonate, iron oxide, silica, or hardened clay.

CONSOLIDATION - Any process whereby loosely aggregated, soft, or liquid earth materials become firm and coherent rock; specif. the solidification of a magma to form an igneous rock, or the lithification of loose sediments to form a sedimentary rock.

CONTAMINANT - As defined by Section 101(f)(33) of Superfund Amendments and Reauthorization Act of 1986 (SARA) shall include, but is not limited to any element, substance compound, or mixture, including disease-causing agents, which after release into the environment and upon exposure, ingestion, inhalation, or assimilation into any organism, either directly from the environment or indirectly by ingestion through food chains, will or may reasonably be anticipated to cause death, disease, behavioral abnormalities, cancer, genetic mutation, physiological malfunctions (including malfunctions in reproduction), or physical deformation in such organisms of their offspring; except that the term "contaminant" shall not include petroleum, including crude oil or any fraction thereof which is not otherwise specifically listed or designated as a hazardous substance under:

(a) any substance designated pursuant to Section 311(b)(2)(A) of the Federal Water Pollution Control Act,

(b) any element, compound, mixture, solution, or substance designated pursuant to Section 102 of this Act,

(c) any hazardous waste having the characteristics identified under or listed pursuant to Section 3001 of the Solid Waste Disposal Act (but not including any waste the regulation of which under the Solid Waste Disposal Act has been suspended by Act of Congress),

(d) any toxic pollutant listed under Section 307(a) of the Federal Water Pollution Control Act,

(e) any hazardous air pollutant listed under Section 112 of the Clean Air Act, and

(f) any imminently hazardous chemical substance or mixture with respect to which the administrator has taken action pursuant to Section 7 of the Toxic Substance Control Act;

and shall not include natural gas, liquefied natural gas, or synthetic gas of pipeline quality (or mixtures of natural gas and such synthetic gas).

CREEK - A term generally applied to any natural stream of water, normally larger than a brook but smaller than a river.

CRITICAL HABITAT - The specific areas within the geographical area occupied by the species on which are found those physical or biological features (I) essential to the conservation of the species and (II) which may require special management consideration or protection.

CUESTA - An asymmetrical ridge, with a long, gentle slope on one side conforming with the dip of the underlying strata, and a steep or clifflike face on the other side formed by the outcrop of the resistant beds.

DEPOSITS - Earth material of any type, either consolidated or unconsolidated, that has accumulated by some natural process or agent.

DIABASE - An intrusive rock whose main components are labradorite and pyroxene and which is characterized by ophitic texture.

DIORITE - A group of igneous rocks composed of dark-colored amphibole (esp. hornblende) oligoclase, andesine, pyroxene, and small amounts of quartz; the intrusive equivalent of andesite.

DIP - The angle that a stratum or any planar feature makes with the horizontal, measured perpendicular to strike and in the vertical plane.

DOLOMITE - A sedimentary rock consisting of calcium magnesium carbonate, $CaMg(CO_3)_2$. Occurs in beds formed by the alteration of limestone.

DRAINAGE CLASS (natural) - Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained - Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained - Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well-drained - Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well-drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained - Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically for long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

Somewhat poorly drained - Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained - Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough periods during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained - Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients, as for example in "hillpeats" and "climatic moors."

DRAINAGEWAY - A channel or course along which water moves in draining an area.

ENDANGERED SPECIES - Any species which is in danger of extinction throughout all or a significant portion of its range, other than a species of the Class Insecta determined by the secretary to constitute a pest whose protection would present an overwhelming and overriding risk to man.

EROSION - The general process or the group of processes whereby the materials of the Earth's crust are loosened, dissolved, or worn away, and simultaneously moved from one place to another by natural agencies, but usually exclude mass wasting.

FELDSPAR - Any of several crystalline minerals made up of aluminum silicates with sodium, potassium, or calcium, usually glassy and moderately hard, found in igneous rocks.

FELDSPATHIC - Like or as feldspar.

FERRUGINOUS - Pertaining to or containing iron.

FINE-GRAINED - Said of a soil in which silt and/or clay predominate.

FINE-TEXTURED (heavy textured) SOIL - Sandy clay, silty clay, and clay.

FLOOD PLAIN - The surface or strip of relatively smooth land adjacent to a river channel, constructed by the present river in its existing regimen and covered with water when the river overflows its banks.

FOLD [geol struc] - A curve or bend of a planar structure such as rock strata, bedding planes, foliation or cleavage.

FORMATION - A lithologically distinctive, mappable body of rock.

FOSSILIFEROUS - Containing fossils.

FRACTURE [struc geol] - A general term for any break in a rock, whether or not it causes displacement, due to mechanical failure by stress. Fracture includes cracks, joints, and faults.

GABBRO - A group of dark-colored, basic intrusive igneous rocks composed principally of basic plagioclase and clinopyroxene, with or without olivine and othoxypyrene; approximate intrusive equivalent of basalt.

GEOLOGIC TIME - See Figure Gl.1

GLAUCONITIC SANDSTONE - Greensand, composed of a green mineral, closely related to the micas and essentially a hydrous potassium iron silicate.

GNEISS - A coarse-grained, foliated rock produced by regional metamorphism; commonly feldspar- and quartz-rich.

GRANITE - Broadly applied, any crystalline, quartz-bearing plutonic rock; also commonly contains feldspar, mica, hornblende, or pyroxene.

GRANODIORITE - A group of coarse-grained plutonic rocks intermediate in composition between quartz diorite and quartz monzonite, containing quartz, plagioclase, and potassium feldspar with biotite, horneblende, or more rarely, pyroxene, as the mafic contents.

GRAVEL - An unconsolidated, natural accumulation of rounded rock fragments resulting from erosion, consisting predominantly of particles larger than sand, such as boulders, cobbles, pebbles, granules or any combination of these fragments.

GRAYWACKE - A non-porous, dark-colored sandstone containing angular grains and fragments of other rocks; a fine-grained conglomerate resembling sandstone.

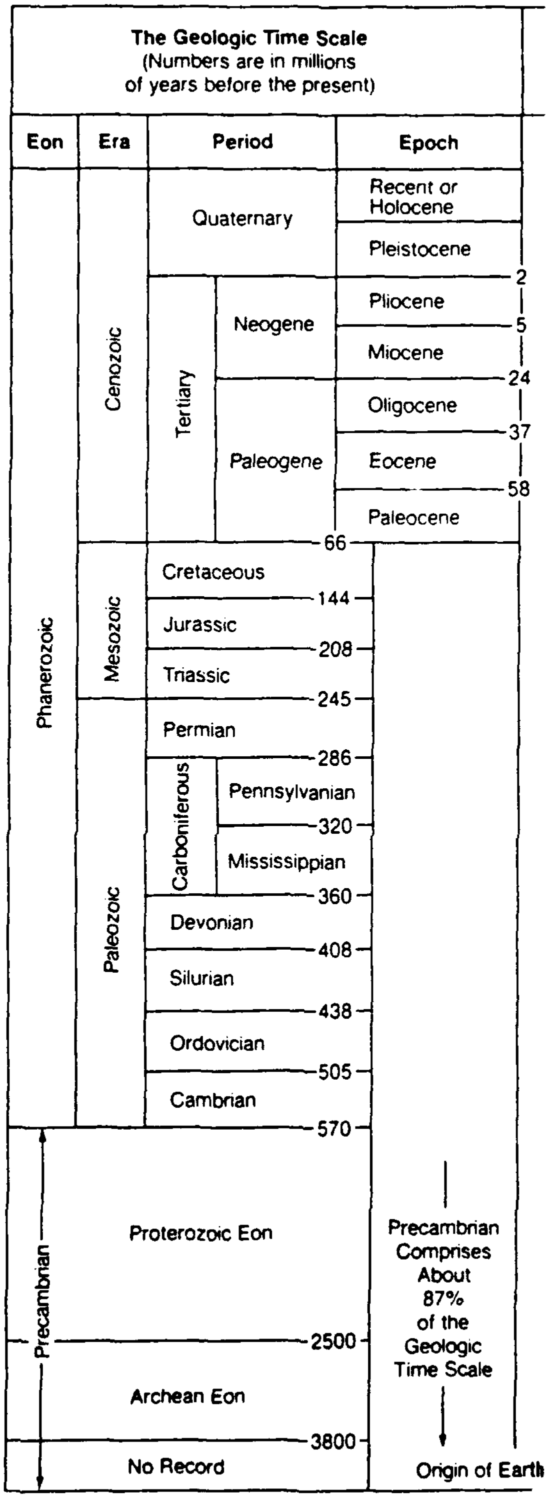

Figure Gl.1

The Geologic Time Scale

GROUNDWATER - Refers to the subsurface water that occurs beneath the water table in soils and geologic formations that are fully saturated.

HARM - Hazard Assessment Rating Methodology - A system adopted and used by the United States Air Force to develop and maintain a priority listing of potentially contaminated sites on installations and facilities for remedial action based on potential hazard to public health, welfare, and environmental impacts. (Reference: DEQPPM 81-5, December 11, 1981.)

HAS - Hazard Assessment Score - The score developed by using the Hazard Assessment Rating Methodology (HARM).

HAZARDOUS MATERIAL - Any substance or mixture of substances having properties capable of producing adverse effects on the health and safety of the human being. Specific regulatory definitions also found in OSHA and DOT rules.

HAZARDOUS WASTE - A solid or liquid waste that, because of its quantity, concentration, or physical, chemical, or infectious characteristics may:

a. cause, or significantly contribute to, an increase in mortality or an increase in serious or incapacitating reversible illness, or

b. pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, disposed of, or otherwise managed.

HERBICIDE - A weed killer.

HIGHLAND - A general term for a relatively large area of elevated or mountainous land standing prominently above adjacent low areas; and mountainous region.

HILL - A natural elevation of the land surface, rising rather prominently above the surrounding land, usually of limited extent and having a well-defined outline (rounded) and generally considered to be less than 1000 feet from base to summit.

IGNEOUS ROCKS - Rock or mineral that has solidified from molten or partially molten material, i.e. from magma.

INTERBEDDED - Beds lying between or alternating with others of different character; especially rock material laid down in sequence between other beds.

KARST - A type of topography that is formed over limestone, dolomite,or gypsum by dissolution, and that is characterized by sinkholes, caves and underground drainage.

KLIPPE - An isolated mass of rock that is an erosional remnant or outlier of a nappe.

LIMESTONE - A sedimentary rock consisting of the mineral calcite (calcium carbonate, $CaCo_3$) with or without magnesium carbonate.

LIMONITE - A common secondary material, formed by weathering (oxidation) of iron-bearing materials.

LITHOLOGY - (a) The description of rocks. (b) The physical character of a rock.

LOAM - A rich, permeable soil composed of a friable mixture of relatively equal proportions of sand, silt, and clay particles, and usually containing organic matter.

LOWLAND - A general term for low-lying land or an extensive region of low land, especially near the coast and including the extended plains or country lying not far above tide level.

MARBLE - A metamorphic rock consisting predominantly of fine- to coarse-grained recrystallized calcite and/or *dolomite*, usually with granoblastic, saccharoidal texture.

MARSH - A water-saturated, poorly drained area, intermittently or permanently water-covered, having aquatic and grasslike vegetation, essentially without the formation of peat.

MEAN LAKE EVAPORATION - The total evaporation amount for a particular area; amount based on precipitation and climate (humidity).

METAMORPHIC ROCK - Any rock derived from pre-existing rocks by mineralogical, chemical, and/or structural changes, essentially in solid state, in response to marked changes in temperature, pressure, shearing stress, and chemical environment, generally at depth in the Earth's crust.

MIGRATION [Contaminant] - The movement of contaminants through pathways (groundwater, surface water, soil, and air).

MINERAL - A naturally occurring inorganic element or compound having an orderly internal structure and characteristic chemical composition, crystal form and physical properties.

MOTTLED [soil] - A soil that is irregularly marked with spots or patches of different colors, usually indicating poor aeration or seasonal wetness.

NAPPE - A sheetlike, allochthonous, folded rock unit in which the axial plane is horizontal or subhorizontal. The mechanism may be thrust faulting, recumbent folding, or gravity sliding.

NET PRECIPITATION - Precipitation minus evaporation.

OUTCROP - That part of a geologic formation or structure that appears at the surface of the Earth; also, bedrock that is covered only by surficial deposits such as alluvium.

OVERTURNED - Said of a fold or the limb of a fold, that has tilted beyond the perpendicular sequence of strata and thus appears reversed.

PD-680 - A cleaning solvent composed predominately of mineral spirits; Stoddard solvent.

PEAT - An unconsolidated deposit of semicarbonized plant remains in a water-saturated environment and of persistently high moisture content (at least 75%).

PERMEABILITY - The capacity of a porous rock, sediment, or soil for transmitting a fluid without impairment by the structure of the medium; it is a measure of the relative ease of fluid flow under unequal pressure.

POND - A natural body of standing fresh water occupying a small surface depression, usually smaller than a lake and larger then a pool.

POROSITY - The ratio by the aggregate volume of interstices in a rock or soil to its total volume.

POTENTIOMETRIC SURFACE - An imaginary surface representing the total head of groundwater and defined by the level to which water will rise in a well. The water table is a particular potentiometric surface.

QUARTZ - A crystalline silica, an important rock forming mineral: SiO_2. Occurs either in transparent hexagonal crystals (colorless or colored by impurities) or in crystalline. Forms the major proportion of most sands and has a widespread distribution in igneous, metamorphic and sedimentary rocks.

QUARTZITE [meta] - A granoblastic metamorphic rock consisting mainly of quartz and formed by recrystallization of sandstone or chert by either regional or thermal metamorphism.

RECUMBENT FOLD - An overturned fold in which the axial surface is more or less horizontal.

RIVER - A general term for a natural freshwater surface stream of considerable volume and a permanent or seasonal flow, moving in a definite channel toward a sea, lake, or another river.

SALINE [adj] - Salty; containing dissolved sodium chloride.

SAND - A rock or mineral particle in the soil, having a diameter in the range 0.52 - 2 mm.

SANDSTONE - A medium-grained fragmented sedimentary rock composed of abundant round or angular sand fragments set in a fine-grained matrix (silt or clay) and more or less firmly united by a cementing material (commonly silica, iron oxide, or calcium carbonate).

SANDY LOAM - A soil containing 43 - 85% sand, 0 - 50% silt, and 0 - 20% clay, or containing at least 52% sand and no more than 20% clay and having the percentage of silt plus twice the percentage of clay exceeding 30% or containing 43 - 52% sand, less than 50% silt, and less than 7% clay.

SCHIST - A medium- or coarse-grained, strongly foliated, crystalline rock; formed by dynamic metamorphism.

SCHISTOCITY - The foliation in schist or other coarse-grained, crystalline rock due to the parallel, planar arrangement of mineral grains of the platy, prismatic, or ellipsoidal types, usually mica.

SEDIMENT - Solid fragmental material that originates from weathering of rocks and is transported or deposited by air, water, or ice, or that accumulates by other natural agents, such as chemical precipitation from solution or secretion by organisms, and that forms in layers on the Earth's surface at ordinary temperatures in a loose, unconsolidated form; (b) strictly solid material that has settled down from a state of suspension in a liquid.

SEDIMENTARY ROCK - A rock resulting from the consolidation of loose sediment that has accumulated in layers; e.g., a clastic rock (such as conglomerate or tillite) consisting of mechanically formed fragments of older rock transported from its source and deposited in water or from air or ice; or a chemical rock (such as rock salt or gypsum) formed by precipitation from solution; or an organic rock (such as certain limestones) consisting of the remains or secretions of plants and animals.

SHALE - A fine-grained detrital sedimentary rock, formed by the consolidation (especially by compression) of clay, silt, or mud.

SILT [soil] - (a) A rock or mineral particle in the soil, having a diameter in the range 0.002-0.005 mm; (b) A soil containing more than 80% silt-size particles, less than 12% clay, and less than 20% sand.

SILT LOAM - A soil containing 50 - 88% silt, 0 - 27% clay, and 0 - 50% sand.

SILTSTONE - An indurated silt having the texture and composition of shale but lacking its fine lamination or fissility; a massive mudstone in which silt predominates over clay.

SLATE - A compact, fine-grained metamorphic rock that possesses slaty cleavage and hence can be split into slabs and thin plates. Most slate was formed from shale.

SOIL PERMEABILITY - The characteristic of the soil that enables water to move downward through the profile. Permeability is measured as the distance per unit time that water moves downward through the saturated soil.

Terms describing permeability are:

Very Slow	-	less than 0.06 inches per hour (less than 4.24×10^{-5} cm/sec)
Slow	-	0.06 to 0.20 inches per hour (4.24×10^{-5} to 1.41×10^{-4} cm/sec)
Moderately Slow	-	0.20 to 0.63 inches per hour (1.41×10^{-4} to 4.45×10^{-4} cm/sec)
Moderate	-	0.63 to 2.00 inches per hour (4.45×10^{-4} to 1.41×10^{-3} cm/sec)
Moderately Rapid	-	2.00 to 6.00 inches per hour (1.41×10^{-3} to 4.24×10^{-3} cm/sec)
Rapid	-	6.00 to 20.00 inches per hour (4.24×10^{-3} to 1.41×10^{-2} cm/sec)
Very Rapid	-	more than 20.00 inches per hour (more than 1.41×10^{-2} cm/sec)

(Reference: U.S.D.A. Soil Conservation Service)

SOIL REACTION - The degree of acidity or alkalinity of a soil, expressed in pH values. A soil that tests of pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as:

	pH
Extremely acid	Below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

SOIL STRUCTURE - The arrangement of primary soil particles into compound particles or aggregates that are separated from adjoining aggregates. The principal forms of soil structure are -- platty (laminated), prismatic (vertical axis of aggregates longer than horizontal), columnar (prisms with rounded tops), blocky (angular or subangular), and granular. Structureless soils are either single grained (each grain by itself, as in dune sand) or massive (the particles adhering without any regular cleavage, as in many hardpans).

SOLVENT - A substance, generally a liquid, capable of dissolving other substances.

STONE - A general term for rock that is used for construction, either crushed for use as aggregate or cut into shaped blocks as dimension stone.

STRATIFIED - Formed, arranged, or laid down in layers or strata; especially said of any layered sedimentary rock or deposit.

STRATIGRAPHIC UNIT - A body of strata recognized as a unit for description, mapping, or correlation.

STRIKE - The direction taken by a structural surface, e.g., a bedding or fault plane, as it intersects the horizontal.

STRIKE - SLIP FAULT - A fault on which the movement is parallel to the fault's strike.

STRUCTURAL - Of or pertaining to rock deformation or to features that result from it.

SURFACE WATER - All water exposed at the ground surface, including streams, rivers, ponds, and lakes.

SWAMP - An area intermittently or permanently covered with water, having shrubs and trees but essentially without the accumulation of peat.

SYNCLINE - A fold of which the core contains the stratigraphically younger rocks; it is generally concave upward.

SYNCLINORIUM - A composite synclinal structure of regional extent composed of lesser folds.

TERRACE [geomorph] - Any long, narrow, relatively level or gently inclined surface, generally less broad than a plain, bounded along one edge by a steeper descending slope and along the other by a steeper ascending slope.

TERRACE [soil] - A horizontal or gently sloping ridge or embankment of earth built along the contours of a hillside for the purpose of conserving moisture, reducing erosion, or controlling runoff.

THREATENED SPECIES - Any species which is likely to become an endangered species within the foreseeable future throughout all or significant portion of its range.

TIME [geol] - See Figure Gl.1.

TOPOGRAPHY - The general conformation of a land surface, including its relief and the position of its natural and man-made features.

UNCONSOLIDATED - (a) Sediment that is loosely arranged or unstratified, or whose particles are not cemented together, occurring either at the surface or at depth. (b) Soil material that is in a loosely aggregated form.

UNDULATING [geomorph] - (a) A landform having a wavy outline or form. (b) A rippling or scalloped land surface, having a wavy outline or appearance.

VALLEY - Any low-lying land bordered by higher ground, especially an elongate, relatively large, gently sloping depression of the earth's surface, commonly situated between two mountains or between ranges of hills and mountains, and often containing a stream or river with an outlet. It is usually developed by stream or river erosion, but can be formed by faulting.

VEIN [intrus rock] - A thin, sheetlike igneous intrusion into a fissure.

WATER TABLE - The upper limit of the portion of the ground that is wholly saturated with water; the surface on which the fluid pressure in the pores of a porous medium is exactly atmospheric.

WETLANDS - Those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.

WILDERNESS AREA - An area unaffected by anthropogenic activities and deemed worthy of special attention to maintain its natural condition.

Appendix A

Outside Agency Contact List

OUTSIDE AGENCY CONTACT LIST

1) Alpha Fire Department
400 West Beaver Avenue
State College, Pennsylvania 16801
Ernest Sauers
(814) 237-5359

2) Centre County Planning Commission
3rd Floor Willowbank Building
Bellefonte, Pennsylvania 16823
(814) 355-6791

3) College Township
1481 East College Avenue
State College, Pennsylvania 16801
William Weaver
(814) 231-3021

4) Commonwealth of Pennsylvania
Bureau of Forestry
Forest Advisory Services
P.O. Box 8552
Harrisburg, Pennsylvania 17105-8552
Kathy McKenna
Ed Dix
(717) 787-3444

5) Commonwealth of Pennsylvania
Department of General Services
State Bookstore
P.O. Box 1365
Harrisburg, Pennsylvania 17105
Patricia Chapman
(717) 787-5109

6) Commonwealth of Pennsylvania
Fisheries Environmental Services Section
Bureau of Fisheries and Engineering
Pennsylvania Fish Commission
450 Robinson Lane
Bellefonte, Pennsylvania 16823
Clark Shiffer
(814) 359-5100

OUTSIDE AGENCY CONTACT LIST (continued)

7) Commonwealth of Pennsylvania
Pennsylvania Department of Environmental Resources
Regional Water Quality Management
200 Pike Street
Williamsport, Pennsylvania 17701
William Parsons
(717) 327-3670

8) Commonwealth of Pennsylvania
Pennsylvania Game Commission
Bureau of Land Management
2001 Elmerton Avenue
Harrisburg, Pennsylvania 17110-9797
Denver A. McDowell, Jr.
(717) 783-8743

9) Commonwealth of Pennsylvania
Topographic and Geological Survey
Department of Environmental Resources
P.O. Box 2357
Harrisburg, Pennsylvania 17120
Mari G. Barnhart and Dawna Yannacci
(717) 787-5828

10) Office of Physical Plant
Physical Plant Building
The Pennsylvania State University
University Park, Pennsylvania 16802
Lloyd A. Niemann
(814) 863-0431

11) 193rd Civil Engineering Squadron
Pennsylvania Air National Guard
Harrisburg International Airport
Middletown, Pennsylvania 17057-5086
Major Donald Bubb
(717) 948-2257

OUTSIDE AGENCY CONTACT LIST (continued)

12) State College Borough
Zoning Department
Room 207
118 South Fraser Street
State College, Pennsylvania 16801
Herman Slaybaugh
(814) 234-7193

13) West Penn Power Company
2800 East College Avenue
State College, Pennsylvania 16801
Robert Rhodes
(814) 237-5821 [Extension 236]

14) Western Pennsylvania Conservancy
PNDI - Western Office
316 Fourth Avenue
Pittsburgh, Pennsylvania 15222
Chris J. Boget
(412) 288-2777

Appendix B

USAF Hazard Assessment Rating Methodology

USAF HAZARD ASSESSMENT RATING METHODOLOGY

The DoD has developed a comprehensive program to identify, evaluate, and control hazardous waste disposal practices associated with past waste disposal techniques at DoD facilities. One of the actions required under this program is to:

> Develop and maintain a priority listing of contaminated installations and facilities for remedial action based on potential hazard to public health, welfare, and environmental impacts (Reference: DEQPPM 81-5, December 11, 1981).

Accordingly, the USAF has sought to establish a system to set priorities for taking further action at sites based upon information gathered during the PA phase of the IRP.

PURPOSE

The purpose of the site rating model is to assign a ranking to each site where there is suspected contamination from hazardous substances. This model will assist the ANG in setting priorities for follow-up site investigations.

This rating system is used only after it has been determined that (1) potential for contamination exists (hazardous waste present in sufficient quantity), and (2) potential for migration exists. A site may be deleted from ranking consideration on either basis.

DESCRIPTION OF THE MODEL

Like the other hazardous waste site ranking models, the USAF's site rating model uses a scoring system to rank sites for priority attention. However, in developing this model, the designers incorporated some special features to meet specific DoD needs.

The model uses data readily obtained during the Preliminary Assessment portion of the IRP. Scoring judgment and computations are easily made. In assessing the hazards at a given site, the model develops a score based on the most likely routes of contamination and worst hazards at the site. Sites are given low scores only if there are clearly no hazards. This approach meshes well with the policy for evaluating and setting restrictions on excess DoD properties.

Site scores are developed using the appropriate ranking factors presented in this appendix. The site rating form and the rating factor guidelines are provided at the end of this appendix.

As with the previous model, this model considers four aspects of the hazard posed by a specific site: (1) possible receptors of the contamination, (2) the waste and its characteristics, (3) the potential pathways for contaminant migration, and (4) any effort that was made to contain the waste resulting from a spill.

The receptors category rating is based on four rating factors: (1) the potential for human exposure to the site, (2) the potential for human ingestion of contaminants should underlying aquifers be polluted, (3) the current and anticipated use of the surrounding area, and (4) the potential for adverse effects upon important biological resources and fragile natural settings. The potential for human exposure is evaluated on the basis of the total population within 1000 feet of the site, and the distance between the site and the base boundary. The potential for human ingestion of contaminants is based on the distance between the site and the nearest well, the groundwater use of the uppermost aquifer, and population served by the groundwater supply within 3 miles of the site. The uses of the surrounding area are determined by the zoning within a 1-mile radius. Determination of whether or not critical environments exist within a 1-mile radius of the site predicts the potential for adverse effects from the site upon important biological resources and fragile natural settings. Each rating factor is numerically evaluated (0-3) and increased by a multiplier. The maximum possible score is also computed. The factor score and maximum possible scores are totaled, and the receptors subscore computed as follows: receptors subscore = (100 X factor subtotal/maximum score subtotal).

The waste characteristics category is scored in three steps. First, a point rating is assigned based on an assessment of the waste quantity and the hazard (worst case) associated with the site. The level of confidence in the information is also factored into the assessment. Next, the score is multiplied by a waste persistence factor, which acts to reduce the score if the waste is not very persistent. Finally, the score is further modified by the physical state of the waste. Liquid wastes receive the maximum score while scores for solids are reduced.

The pathways category rating is based on evidence of contaminant migration along one of three pathways: surface water migration, flooding, and groundwater migration. If evidence of contaminant migration exists, the category is given a subscore of 80 to 100 points. For indirect evidence, 80 points are assigned, and for direct evidence, 100 points are assigned. If no evidence is found, the highest score among the three possible routes is used. The three pathways are evaluated and the highest score among all four of the potential scores is used.

The scores for each of the three categories are added together and normalized to a maximum possible score of 100. Then the waste management practice category is scored. Scores for sites with no containment are not reduced. Scores for sites with limited containment can be reduced by 5 percent. If a site is contained and well-managed, its score can be reduced by 90 percent. The final site score is calculated by applying the waste management practices category factor to the sum of the score for the other three categories.

HAZARD ASSESSMENT RATING FORM

NAME OF SITE

LOCATION ____________________

DATE OF OPERATION OR OCCURRENCE ____________________

OWNER/OPERATOR ____________________

COMMENTS/DESCRIPTION ____________________

SITE RATED BY ____________________

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1000 ft. of site		4		12
B. Distance to nearest well		10		30
C. Land use-zoning within 1-mile radius		3		9
D. Distance to installation boundary		6		18
E. Critical environments within 1-mile radius of site		10		30
F. Water quality of nearest surface water body		6		18
G. Groundwater use of uppermost aquifier		9		27
H. Population served by surface water supply within 3 miles downstream of site		6		18
I. Population served by groundwater supply within 3 miles of site		6		18

Subtotals ________ 180

Receptors subscore (100 x factor score subtotal/maximum score subtotal)

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) ________
2. Confidence level (C = confirmed, S = suspected) ________
3. Hazard rating (H = high, M = medium, L = low) ________

Factor Subscore A (from 20 to 100 based on factor score matrix)

B. Apply persistence factor
Factor subscore A x Persistence Factor = Subscore B

________ x ________ = ________

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

________ x ________ =

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists, then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore

B. Rate the migration potential for 3 potential pathways: Surface water migration, flooding, and groundwater migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water		8		24
Net precipitation		6		18
Surface erosion		8		24
Surface permeability		6		18
Rainfall intensity		8		24

Subtotals ________ 108

Subscore (100 x factor score subtotal/maximum score subtotal)

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
2. Flooding		1		3

Subscore (100 x factor score/3)

3. Groundwater migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to groundwater		8		24
Net precipitation		6		18
Soil permeability		8		24
Subsurface flows		8		24
Direct access to groundwater		8		24

Subtotals ________ 114

Subscore (100 x factor score subtotal/maximum score subtotal)

C. Highest pathway score

Enter the highest subscore value from A, B-1, B-2, or B-3 above

Pathways subscore

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors
Waste Characteristics
Pathways

Total ________ divided by 3 = ________
Gross Total Score

B. Apply factor for waste containment from waste management practices.

Gross Total Score x Waste Management Practices Factor = Final Score

________ x ________ = [ ]

HAZARD ASSESSMENT RATING METHODOLOGY GUIDELINES

I. RECEPTORS CATEGORY

	Rating Factors	Rating Scale Levels 0	1	2	3	Multiplier
A.	Population within 1,000 feet (includes on-base facilities)	0	1-25	26-100	Greater than 100	4
B.	Distance to nearest water well	Greater than 3 miles	1 to 3 miles	3,001 feet to 1 mile	0 to 3,000 feet	10
C.	Land use/zoning (within 1-mile radius)	Completely remote (zoning not applicable)	Agricultural	Commercial or Industrial	Residential	3
D.	Distance to installation boundary	Greater than 2 miles	1 to 2 miles	1,001 feet to 1 mile	0 to 1,000 feet	6
E.	Critical environments (within 1-mile radius)	Not a critical environment	Natural areas	Pristine natural areas; minor wetlands; preserved areas; presence of economically important natural resources susceptible to contamination	Major habitat of an endangered or threatened species; presence of recharge area; major wetlands	10
F.	Water quality/use designation of nearest surface water body	Agricultural or Industrial use	Recreation, propagation and management of fish and wildlife	Shellfish propagation and harvesting	Potable water supplies	6
G.	Groundwater use of uppermost aquifer	Not used, other sources readily available	Commercial industrial, or irrigation, very limited other water sources	Drinking water, municipal water available	Drinking water, no municipal water available, commercial, industrial, or irrigation; no other water source available	9
H.	Population served by surface water supplies within 3 miles downstream of site	0	1-50	51-1,000	Greater than 1,000	6
I.	Population served by aquifer supplies within 3 miles of site	0	1-50	51-1,000	Greater than 1,000	6

II. WASTE CHARACTERISTICS

A-1 Hazardous Waste Quantity

S = Small quantity (5 tons or 20 drums of liquid)
M = Moderate quantity (5 to 20 tons or 21 to 85 drums of liquid)
L = Large quantity (20 tons or 85 drums of liquid)

A-2 Confidence Level of Information

C = Confirmed confidence level (minimum criteria below)

- o Verbal reports from interviewer (at least 2) or written information from the records
- o Knowledge of types and quantities of wastes generated by shops and other areas on base

S = Suspected confidence level

- o No verbal reports or conflicting verbal reports and no written information from the records
- o Logic based on a knowledge of the types and quantities of hazardous wastes generated at the base, and a history of past waste disposal practices indicate that these wastes were disposed of at a site

A-3 Hazard Rating

Rating Factors	Rating Scale Levels 0	1	2	3
Toxicity	Sax's Level 0	Sax's Level 1	Sax's Level 2	Sax's Level 3
Ignitability	Flash point greater than 200°F	Flash point at 140°F to 200°F	Flash point at 80°F to 140°F	Flash point less than 80°F
Radioactivity	At or below background levels	1 to 3 times background levels	3 to 5 times background levels	Over 5 times background levels

Use the highest individual rating based on toxicity, ignitability, and radioactivity and determine the hazard rating.

Hazard Rating	Points
High (H)	3
Medium (M)	2
Low (L)	1

II. WASTE CHARACTERISTICS--Continued

Waste Characteristics Matrix

Point Rating	Hazardous Waste Quantity	Confidence Level of Information	Hazard Rating
100	L	C	H
	L	C	M
80	M	C	H
70	L	S	H
	S	C	H
60	M	C	M
	L	S	M
	L	C	L
50	M	S	H
	S	C	M
	S	S	H
	M	S	M
40	M	C	L
	L	S	L
	S	C	L
30	M	S	L
	S	S	M
20	S	S	L

Notes:
For a site with more than one hazardous waste, the waste quantities may be added using the following rules:

Confidence Level
- o Confirmed confidence levels (C) can be added.
- o Suspected confidence levels (S) can be added.
- o Confirmed confidence levels cannot be added with suspected confidence levels.

Waste Hazard Rating
- o Wastes with the same hazard rating can be added.
- o Wastes with different hazard ratings can only be added in a downgrade mode, e.g., MCM + SCH = LCM if the total quantity is greater than 20 tons.

Example: Several wastes may be present at a site, each having an MCM designation (60 points). By adding the quantities of each waste, the designation may change to LCM (80 points). In this case, the correct point rating for the waste is 80.

B. Persistence Multiplier for Point Rating

Multiply Point Rating Persistence Criteria	From Part A by the Following
Metals, polycyclic compounds, and halogenated hydrocarbons	1.0
Substituted and other ring compounds	0.9
Straight chain hydrocarbons	0.8
Easily biodegradable compounds	0.4

C. Physical State Multiplier

Physical state	Multiply Point Total From Parts A and B by the Following
Liquid	1.0
Sludge	0.75
Solid	0.50

III. PATHWAYS CATEGORY

A. Evidence of Contamination

Direct evidence is obtained from laboratory analyses of hazardous contaminants present above natural background levels in surface water, groundwater, or air. Evidence should confirm that the source of contamination is the site being evaluated.

Indirect evidence might be from visual observation (i.e., leachate), vegetation stress, sludge deposits, presence of taste and odors in drinking water, or reported discharges that cannot be directly confirmed as resulting from the site, but the site is greatly suspected of being a source of contamination.

B-1 Potential for Surface Water Contamination

Rating Factors	0	1	2	3	Multiplier
Distance to nearest surface water (includes drainage ditches and storm sewers)	Greater than 1 mile	2,001 feet to a mile	501 feet to 2,000 feet	0 to 500 feet	8
Net precipitation	Less than -10 inches	-10 to +5 inches	+5 to +20 inches	Greater than +20 inches	6
Surface erosion	None	Slight	Moderate	Severe	8
Surface permeability	0% to 15% clay ($>10^{-2}$ cm/sec)	15% to 30% clay (10^{-2} to 10^{-4} cm/sec)	30% to 50% clay (10^{-4} to 10^{-6} cm/sec)	Greater than 50% clay ($<10^{-6}$ cm/sec)	6
Rainfall intensity based on 1-year, 24 hour rainfall (thunderstorms)	<1.0 inch 0-5 0	1.0 to 2.0 inches 6-35 30	2.1 to 3.0 inches 36-49 60	>3.0 inches >50 100	8

B-2 Potential for Flooding

Rating Factors	0	1	2	3	Multiplier
Floodplain	Beyond 100-year floodplain	In 100-year floodplain	In 10-year floodplain	Floods annually	1

B-3 Potential for Groundwater Contamination

Rating Factors	0	1	2	3	Multiplier
Depth to groundwater	Greater than 500 feet	50 to 500 feet	11 to 50 feet	0 to 10 feet	8
Net precipitation	Less than -10 inches	-10 to +5 inches	+5 to +20 inches	Greater than +20 inches	6
Soil permeability	Greater than 50% clay ($<10^{-6}$ cm/sec)	30% to 50% clay (10^{-4} to 10^{-6} cm/sec)	15% to 30% clay 10^{-2} to 10^{-4} cm/sec	0% to 15% clay ($>10^{-2}$ cm/sec)	8
Subsurface flows	Bottom of site greater than 5 feet above high groundwater level	Bottom of site occasionally submerged	Bottom of site frequently submerged	Bottom of site located below mean groundwater level	8
Direct access to groundwater (through faults, fractures, faulty well casings, subsidence, fissures, etc.)	No evidence of risk	Low risk	Moderate risk	High risk	8

IV. WASTE MANAGEMENT PRACTICES CATEGORY

A. This category adjusts the total risk as determined from the receptors, pathways, and waste characteristics categories for waste management practices and engineering controls designed to reduce this risk. The total risk is determined by first averaging the receptors, pathways, and waste characteristics subscores.

B. Waste Management Practices Factor

The following multipliers are then applied to the total risk points (from A):

Waste Management Practice	Multiplier
No containment	1.0
Limited containment	0.95
Fully contained and in full compliance	0.10

Guidelines for fully contained:

Landfills:

- o Clay cap or other impermeable cover
- o Leachate collection system
- o Liners in good condition
- o Adequate monitoring wells

Surface Impoundments:

- o Liners in good condition
- o Sound dikes and adequate freeboard
- o Adequate monitoring wells

Spills:

- o Quick spill cleanup action taken
- o Contaminated soil removed
- o Soil and/or water samples confirm total cleanup of the spill

Fire Protection Training Areas:

- o Concrete surface and berms
- o Oil/water separator for pretreatment of runoff
- o Effluent from oil/water separator to treatment plant

General Note: If data are not available or known to be complete the factor ratings under items I-A through I, III-B-1, or III-B-3, then leave blank for calculation of factor score and maximum possible score.

Appendix C

Site Hazard Assessment Rating Forms and Factor Rating Criteria

HAZARD ASSESSMENT RATING FORM

NAME OF SITE Surface Waste Disposal Area (Site No. 1)

LOCATION Adjacent to Vehicle Maintenance Shop and Access Road

DATE OF OPERATION OR OCCURRENCE Before 1955 to 1990

OWNER/OPERATOR State College Air National Guard Station

COMMENTS/DESCRIPTION

SITE RATED BY Science & Technology, Inc.

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1000 ft. of site	3	4	12	12
B. Distance to nearest well	3	10	30	30
C. Land use-zoning within 1-mile radius	3	3	9	9
D. Distance to installation boundary	3	6	18	18
E. Critical environments within 1-mile radius of site	3	10	30	30
F. Water quality of nearest surface water body	1	6	6	18
G. Groundwater use of uppermost aquifier	3	9	27	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by groundwater supply within 3 miles of site	3	6	18	18
Subtotals			150	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 83

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 60

B. Apply persistence factor
Factor subscore A x Persistence Factor = Subscore B

60 x 1.0 = 60

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

60 x 1.0 = 60

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists, then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 80

B. Rate the migration potential for 3 potential pathways: Surface water migration, flooding, and groundwater migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	3	8	24	24
Net precipitation	2	6	12	18
Surface erosion	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	2	8	16	24
Subtotals			66	108

Subscore (100 x factor score subtotal/maximum score subtotal) 61

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
2. Flooding	0	1	0	3

Subscore (100 x factor score/3) 0

3. Groundwater migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to groundwater	1	8	8	24
Net precipitation	2	6	12	18
Soil permeability	2	8	16	24
Subsurface flows	0	8	0	24
Direct access to groundwater	3	8	24	24
Subtotals			60	114

Subscore (100 x factor score subtotal/maximum score subtotal) 53

C. Highest pathway score

Enter the highest subscore value from A, B-1, B-2, or B-3 above

Pathways subscore 80

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	83
Waste Characteristics	60
Pathways	80

Total 223 divided by 3 = 74

Gross Total Score

B. Apply factor for waste containment from waste management practices.

Gross Total Score x Waste Management Practices Factor = Final Score

74 x 1.0 = 74

HAZARD ASSESSMENT RATING FORM

NAME OF SITE Sump/Dry Well (Site No. 2)

LOCATION Immediately Northwest of Vehicle Wash Rack

DATE OF OPERATION OR OCCURRENCE Unknown (Possible 1955 to 1990)

OWNER/OPERATOR State College Air National Guard Station

COMMENTS/DESCRIPTION

SITE RATED BY Science & Technology, Inc.

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1000 ft. of site	3	4	12	12
B. Distance to nearest well	3	10	30	30
C. Land use-zoning within 1-mile radius	3	3	9	9
D. Distance to installation boundary	3	6	18	18
E. Critical environments within 1-mile radius of site	3	10	30	30
F. Water quality of nearest surface water body	0	6	0	18
G. Groundwater use of uppermost aquifier	3	9	27	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by groundwater supply within 3 miles of site	3	6	18	18
		Subtotals	144	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 80

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 60

B. Apply persistence factor
Factor subscore A x Persistence Factor = Subscore B

60 x 1.0 = 60

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

60 x 1.0 = 60

III. PATHWAYS Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists, then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: Surface water migration, flooding, and groundwater migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	3	8	24	24
Net precipitation	2	6	12	18
Surface erosion	0	8	0	24
Surface permeability	0	6	0	18
Rainfall intensity	2	8	16	24
		Subtotals	52	108

Subscore (100 x factor score subtotal/maximum score subtotal) 48

	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
2. Flooding	0	1	0	3

Subscore (100 x factor score/3) 0

3. Groundwater migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to groundwater	1	8	8	24
Net precipitation	2	6	12	18
Soil permeability	2	8	16	24
Subsurface flows	0	8	0	24
Direct access to groundwater	3	8	24	24
		Subtotals	60	114

Subscore (100 x factor score subtotal/maximum score subtotal) 53

C. Highest pathway score

Enter the highest subscore value from A, B-1, B-2, or B-3 above

Pathways subscore 53

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	80
Waste Characteristics	60
Pathways	53

Total 193 divided by 3 = 64
Gross Total Score

B. Apply factor for waste containment from waste management practices.

Gross Total Score x Waste Management Practices Factor = Final Score

64 x 1.0 = $\boxed{64}$

State College Air National Guard Station
State College, Pennsylvania

USAF Hazard Assessment Rating Methodology
Factor Rating Criteria

The following is an explanation of the HARM factor rating criteria for the potential sites:

I. **Receptors**

A. Population Within 1000 feet of Site.

Site Nos. 1 and 2, Factor Rating 3.
The population within 1000 feet of Site Nos. 1 and 2 is greater than 100. The UTA weekend population of the Station is 168 persons.

B. Distance to Nearest Well.

Site Nos. 1 and 2, Factor Rating 3.
Site Nos. 1 and 2 are located approximately 2500 feet from the nearest water well.

C. Land Use - Zoning (within 1-mile radius).

Site Nos. 1 and 2, Factor Rating 3.
The area within a 1-mile radius of Site Nos. 1 and 2 is predominantly residential. Residences within this area include dormitories on the PSU campus.

D. Distance to Installation Boundary.

Site Nos. 1 and 2, Factor Rating 3.
Site No. 1 is located approximately 70 feet inside the boundary fence at the Station. The northwest boundary fence is about 10 feet northwest of Site No. 2.

E. Critical Environments (within 1-mile radius).

Site Nos. 1 and 2, Factor Rating 3.
Surface water runoff from Site No.1 flows west to a surface water retention basin that recharges aquifers. Surface water entering the Site No. 2 structure may recharge groundwater at this point.

F. **<u>Water Quality/Use Designation of Nearest Surface Water Body.</u>**

Site No. 1, Factor Rating 1; Site No. 2, Factor Rating 0.
Site No. 1 drains into the Spring Creek watershed area. Spring Creek is used for agricultural and industrial purposes but is more important for the propagation of fish and wildlife. It is one of the commonwealth's major trout streams.

The Spring Creek watershed does not receive potentially contaminated surface water flow from Site No. 2.

G. **<u>Groundwater Use of Uppermost Aquifer.</u>**

Site Nos. 1 and 2, Factor Rating 3.
This aquifer is the primary source of potable water for State College.

H. **<u>Population Served by Surface Water Supplies Within 3 Miles Downstream of Site.</u>**

Site Nos. 1 and 2, Factor Rating 0.
Surface water supplies within 3 miles downstream of these sites are not used as sources of potable water.

I. **<u>Population Served by Aquifer Supplies Within 3 Miles of Site.</u>**

Site Nos. 1 and 2, Factor Rating 3.
More than 37,000 people on the PSU campus receive potable water from wells.

II. Waste Characteristics

<u>Site No. 1</u>

A-1: Hazardous Waste Quantity - Factor Rating S (Small).
Less than 1100 gallons of waste oil, fuels, and organic solvents were released at this site.

A-2: Confidence Level - Factor Rating C (Confirmed).
This site was confirmed through interviews with Station personnel.

A-3: Hazard Rating - Factor Rating H (High).
This site was given a high hazard rating because of the high toxicity and high ignitability of some of the materials disposed of at this site.

Site No. 2

A-1: Hazardous Waste Quantity - Factor Rating S (Small).
Less than 1100 gallons of waste ethylene glycol, trichloroethylene, and naphtha were released at this site.

A-2: Confidence Level - Factor Rating C (Confirmed).
This site was confirmed through interviews with Station personnel.

A-3: Hazard Rating - Factor Rating H (High).
This site was given a high hazard rating because of the high toxicity of trichloroethylene and the high ignitability of naphtha.

B. Persistence Multiplier for Point Rating.

Site No. 1 was assigned a persistence multiplier of 1.0 based on the presence of carbon tetrachloride. Site No. 2 was assigned a persistence multiplier of 1.0 based on the presence of trichloroethylene. A persistence multiplier of 1.0 corresponds to the HARM category of "Metals, Polycyclic Compounds, and Halogenated Hydrocarbons."

C. Physical State Multiplier.

A physical state multiplier of 1.0 was applied to Site Nos. 1 and 2 because the substances released were liquids.

III. Pathways Category

A. Evidence of Contamination.

Site No. 1 was given a score of 80 (Indirect Evidence) because it is greatly suspected of being a source of contamination. Petroleum product stains are evident at the site.

Site No. 2 was given a score of 0 because it is not greatly suspected of being a source of contamination. The subsurface location of the sump/dry well obscured visual evidence of contamination and the oral evidence from interviews was not compelling.

B-1. Potential for Surface Water Contamination.

- Distance to Nearest Surface Water: Factor Rating 3. Site Nos. 1 and 2 are located within 500 feet of a drainage ditch.

- Net Precipitation: Factor Rating 2. The average annual net precipitation is 10 inches for Site Nos. 1 and 2.

- Surface Erosion: Site No. 1, Factor Rating 1; Site No. 2, Factor Rating 0. There is slight erosion of soil at Site No. 1. Site No. 2 is covered with pavement

- Surface Permeability: Site No. 1, Factor Rating 1; Site No. 2, Factor Rating 0. The surface permeability at Site No. 1 ranges from 4.45×10^{-4} to 1.41×10^{-3} cm/sec. The surface soil above Site No. 2 is capped with pavement.

- Rainfall Intensity Based on 1-Year, 24-Hour Rainfall: Site Nos. 1 and 2, Factor Rating 2. The rainfall intensity in the Station area is 2.25 inches.

B-2. Potential for Flooding.

Factor Rating 0. Site Nos. 1 and 2 lie beyond the 100-year flood plains of local streams.

B-3. Potential for Groundwater Contamination.

- Depth to Groundwater: Factor Rating 1. The water table in the area of Site Nos. 1 and 2 is 190 feet below the land surface.

- Net Precipitation: Factor Rating 2. The average annual net precipitation is 10 inches for Site Nos. 1 and 2.

- Soil Permeability: Factor Rating 2. Soil permeability at Site Nos. 1 and 2 ranges from 4.45×10^{-4} to 1.41×10^{-3} cm/sec.

- Subsurface Flows: Factor Rating 0. The bottoms of Site Nos. 1 and 2 are greater than 5 feet above high groundwater level.

- o <u>Direct Access to Groundwater:</u> Factor Rating 3. Contaminants at Site Nos. 1 and 2 would have direct access to groundwater through fractures and solutions cavities.

IV. Waste Management Practices Factor

A multiplier of 1.0 is applied to Site Nos. 1 and 2 because they have no form of containment.